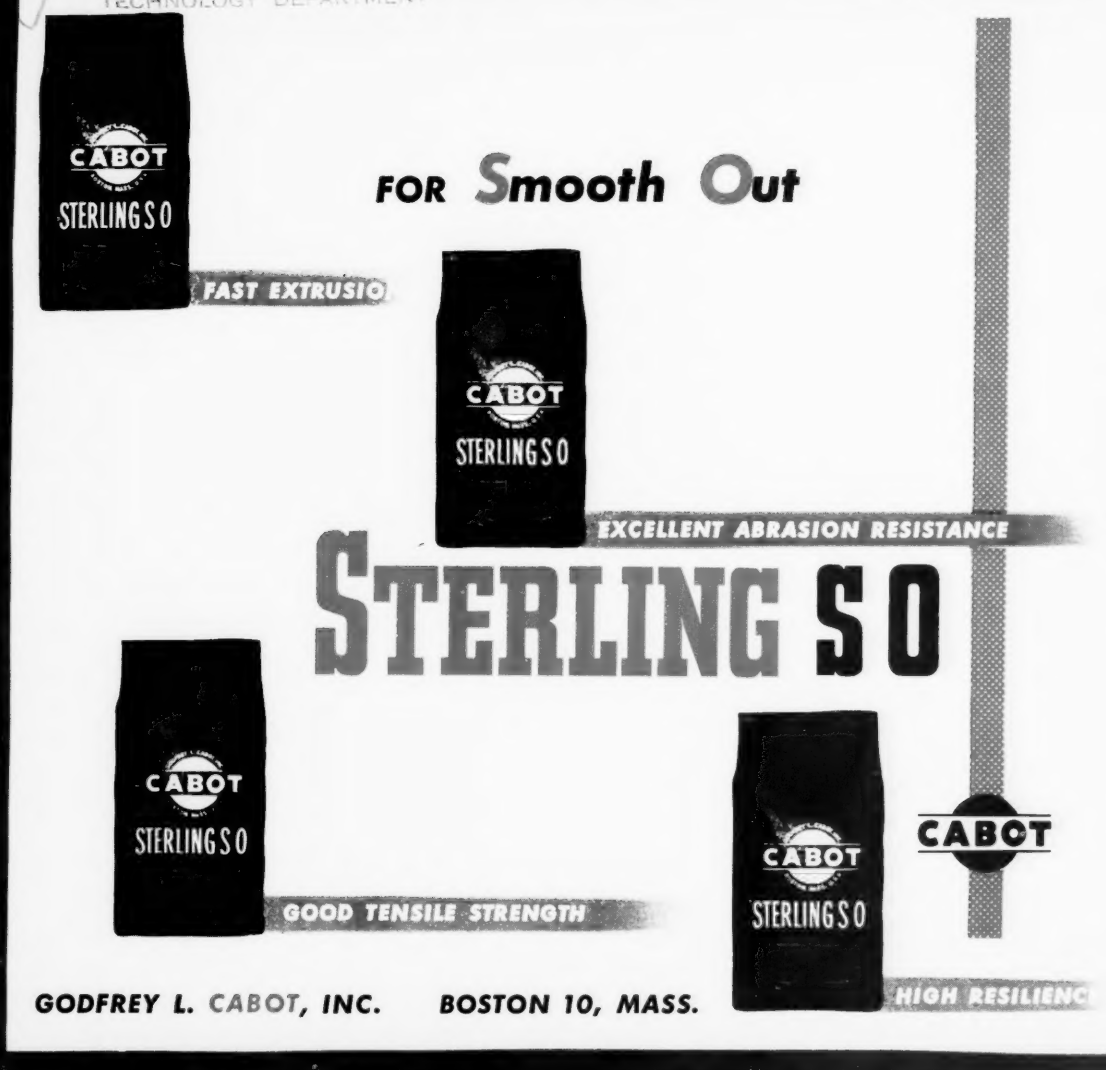
INDIA RUBBER WORLD

NOVEMBER, 1948

TECHNOLOGY DEPARTMENT



Tests show Du Pont POLYAC *gives fast curing neoprene latex films*

TEST RECIPE

NEOPRENE from Type 571 Latex	100.0
ZINC OXIDE	5.0
NEOZONE D	2.0
CLAY	10.0
AQUAREX SMO	1.5
SUNAPTIC ACID	1.0
POLYAC	As Indicated

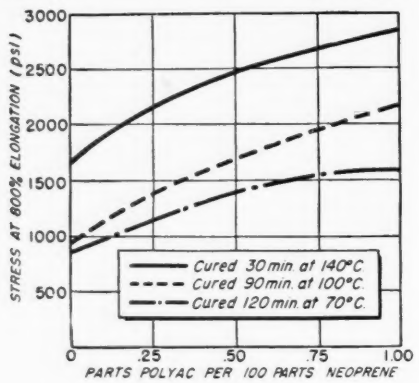


Figure 1

TEST RECIPE

Compound	A	B	C
NEOPRENE from Type 571 Latex	100.0	100.0	100.0
ZINC OXIDE	5.0	5.0	5.0
NEOZONE D	2.0	2.0	2.0
AQUAREX SMO	1.5	1.5	1.5
SUNAPTIC ACID	1.0	1.0	1.0
POLYAC	—	2.0	2.0
2-MT	—	—	1.0

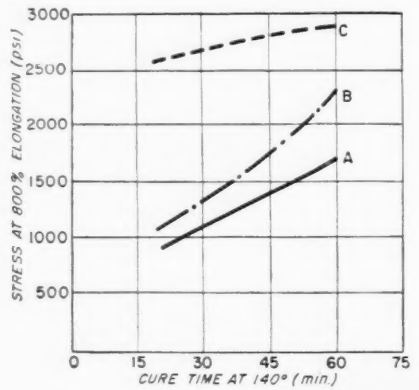


Figure 2

POLYAC *is also valuable as an activator in butyl inner-tube stocks because it increases modulus and hot tear resistance and decreases permanent set. In uncured butyl compounds, Polyac is an effective stiffener, thereby minimizing splice defects.*

Where fast cures are needed, and where films must have high tensile strength, low permanent set and low water absorption, Polyac is an especially effective accelerator for neoprene latex.

Figure 1 shows how varying amounts of Polyac affect the rate of cure of a neoprene latex compound as indicated by 800% modulus. Note that Polyac increased the curing rate at *all* temperatures . . . *even as low as 70° C.* And the films cured with Polyac proved to have higher tensile strength, lower permanent set and lower water absorption.

For even faster cures, Polyac may be used in combination with conventional rubber accelerators such as Tepidone, Zenite, 2-MT or Thiuram M. In Figure 2, the increased curing speed of Polyac—2-MT acceleration is shown. Observe that Compound C, containing both Polyac and 2-MT, has a higher modulus after 20 minutes cure, than either Compound A or B after 60 minutes. *In fact, it was found that Compound C cured as rapidly at 100° C. as Compound A did at 140° C.*

For a sample of Polyac for testing in your neoprene latex compounds, write to: E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Div., Wilmington 98, Delaware.

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BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

India Rubber World, November, 1948, Vol. 119, No. 2. Published Monthly by Bill Brothers Publishing Corp., Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U.S.A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription United States and Mexico, $3.00 per year; Canada, $4.00. All Other Countries, $5.00. Single Copies 35 cents. Address Mail to New York Office.

TWO NEW PLASTICIZERS FOR VINYL RESINS

New Hycar Nitrile Polymers make processing easier and widen fields for makers of many products

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★ **NON-MIGRATING**—won't soften or pick up varnish.

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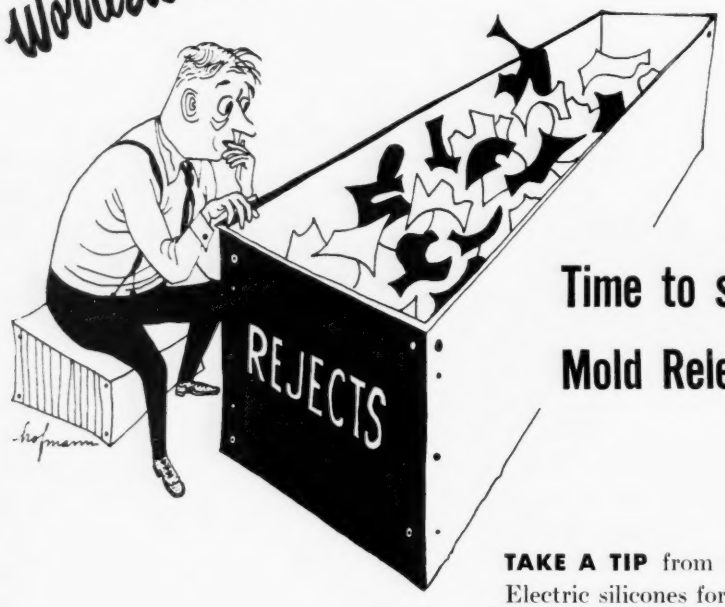

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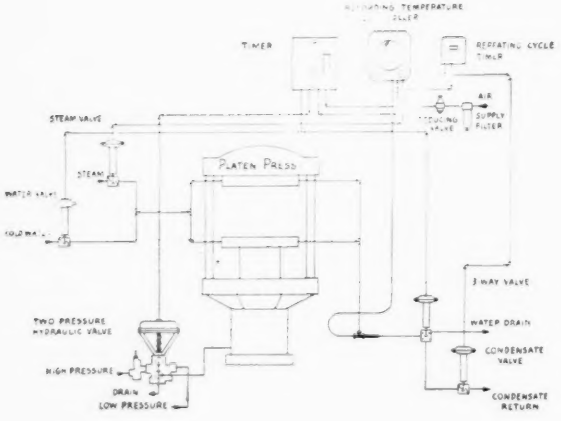

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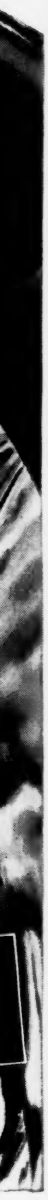

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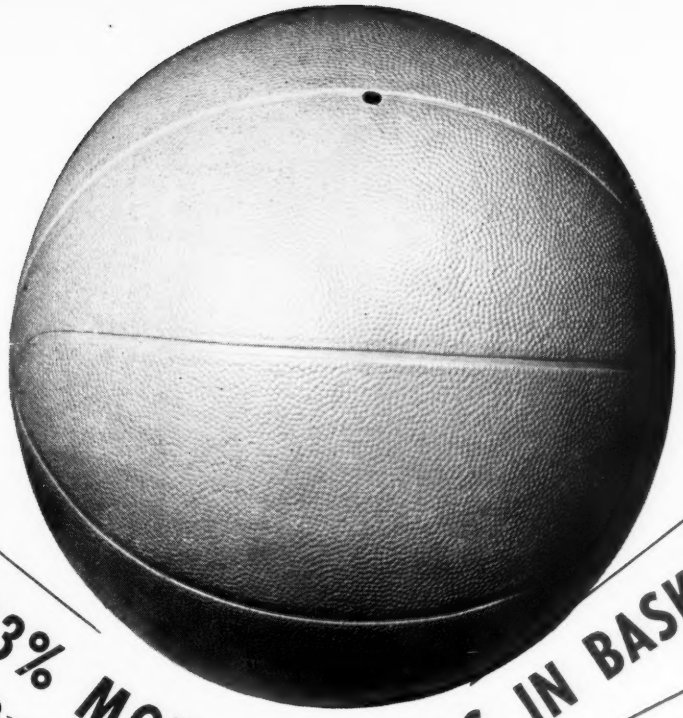

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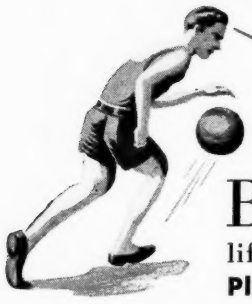

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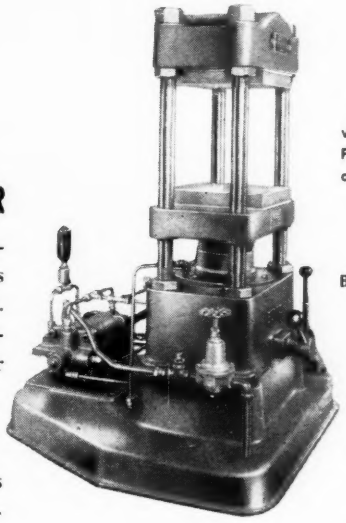

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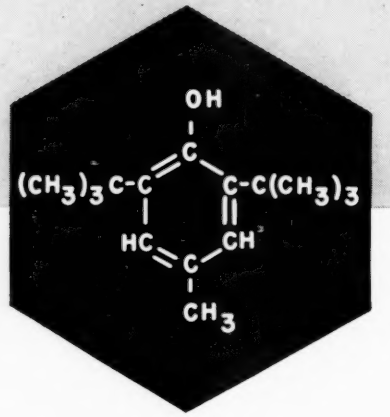

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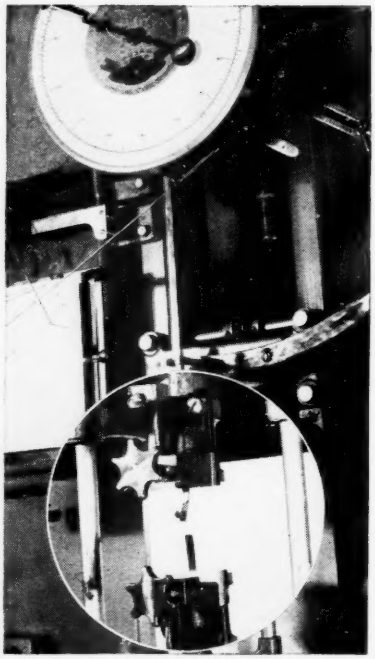

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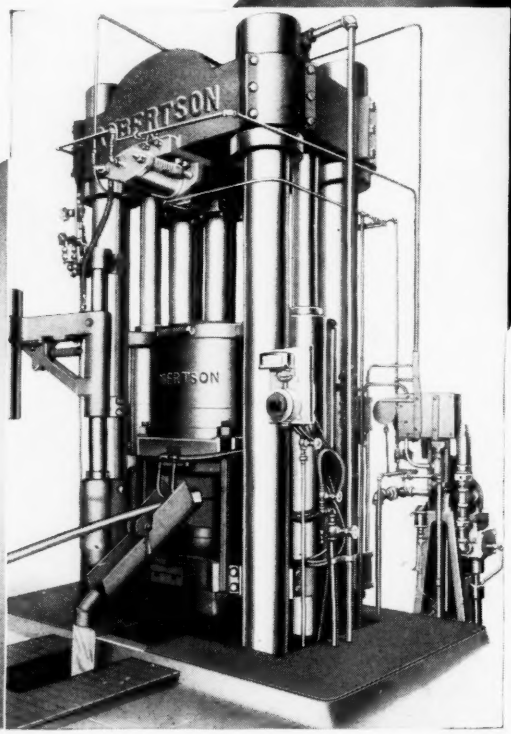

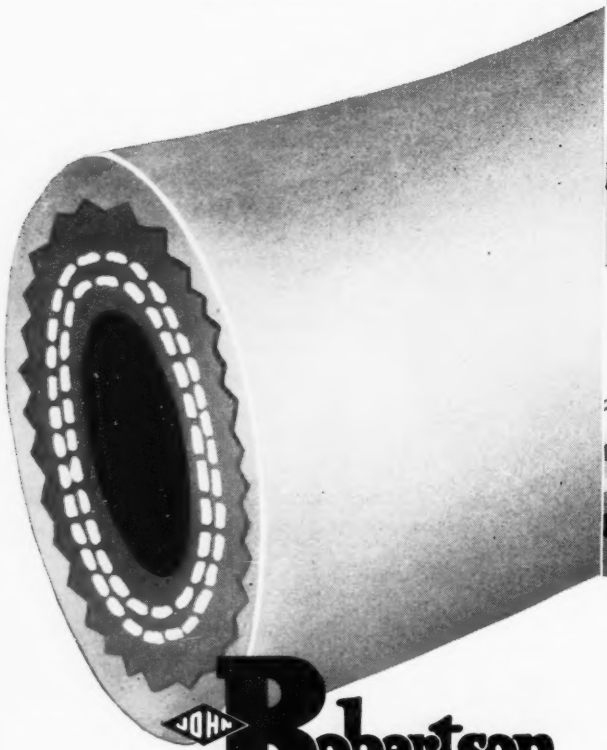

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Increase Banbury output, save labor and power costs.

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Improve molding quality and reduce curing defects.

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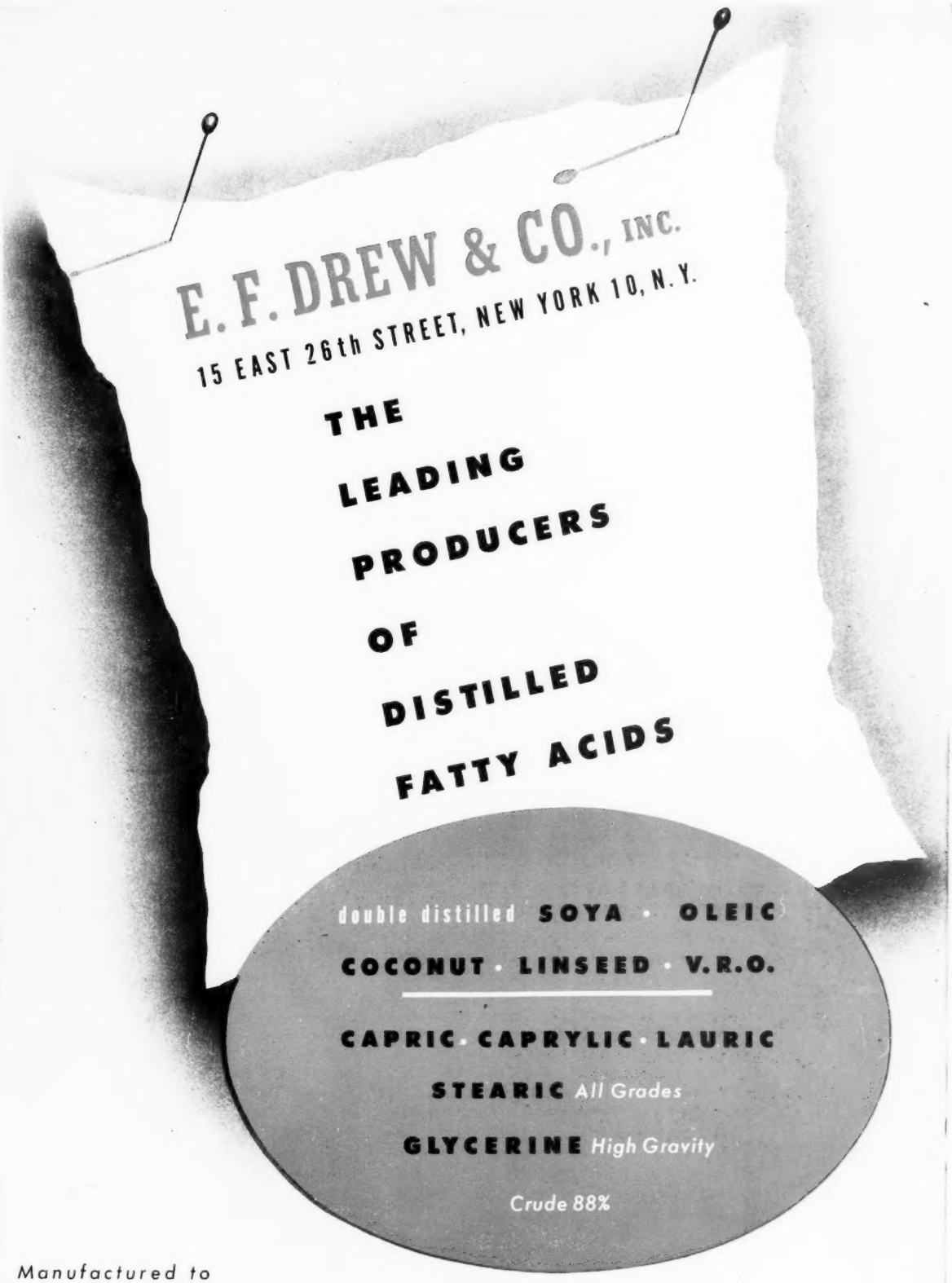
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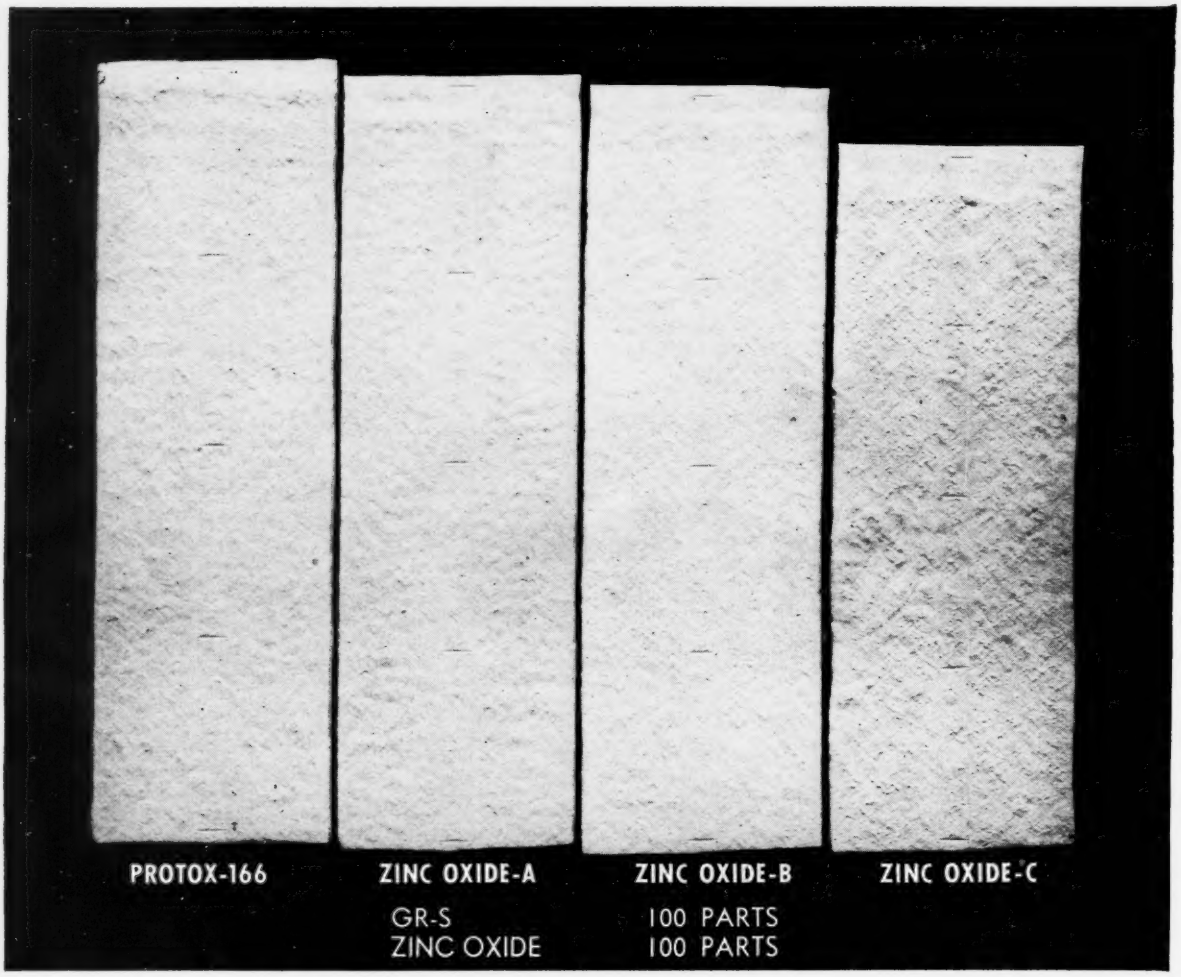
PROTOX-166 ZINC OXIDE*



CALENDER SHRINKAGE—GR-S

RESULTS on calender shrinkage for compounds containing equal parts by weight of Zinc Oxide and Natural Rubber were reported in the September Rubber Journals. The results presented herewith were obtained in GR-S, which was given four ten-minute breakdowns in a 00 Banbury mixer prior to the addition of Zinc Oxide. The several brands of Zinc Oxide were incorporated in the Banbury under the same conditions. The warm-up and calendering operations were also carefully controlled. On cooling, the contractions for the several brands were as follows:

Protox-166	— 48.2%
Zinc Oxide-A	— 48.8%
Zinc Oxide-B	— 49.4%
Zinc Oxide-C	— 54.0%

Comparing the GR-S results with those obtained with Natural Rubber, it will be noted that the plasticizing effect of Zinc Oxide is greater in the Natural product. Differences between the brands of Zinc Oxide are also less conspicuous in GR-S.

If you have not tried PROTOX-166 (formerly XX-166) in your processing, we invite you to do so, and will gladly send you a sample.

*U.S. Patents 2,303,329 and 2,303,330

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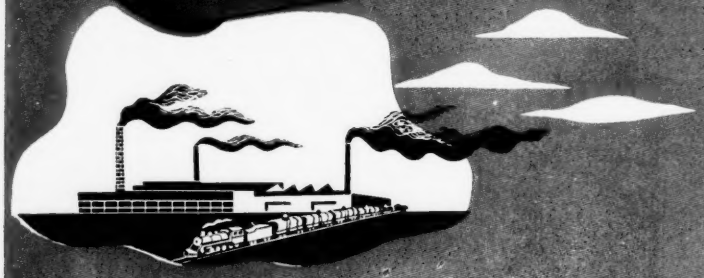
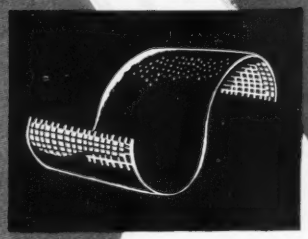
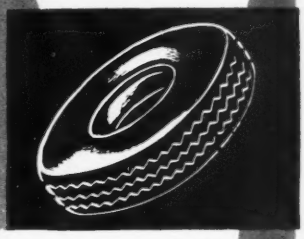
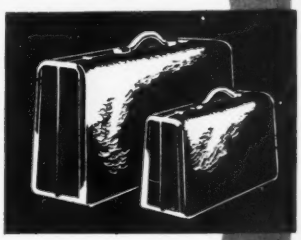




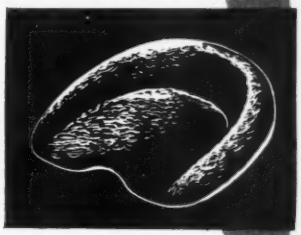
● Flintkote Saturants are widely used for fabric sizing, and in the Rug and Carpet industry to improve wear and appearance of the finished product.



● In tire manufacture, Flintkote Tire Cord Solutioning for rayon and cotton tire cord insures a firm, durable bond of rubber to carcass...so important to tire life.



● New adhesives are replacing stitching, riveting and other old methods of fastening in many industries. Many luggage makers save time and money by assembling with Flintkote Industrial Adhesives.



● Flintkote Binder Compounds are helping many fabricators speed up their production. Among the uses of such compounds are curled hair (above) and glass fibers.

● Out of Flintkote research flows new *utility* for elastomers. With it, come advantages in performance and *use* to manufacturers and processors.

Flintkote has applied research to many compounding problems. And, as a result, offers a wide line of rubbers, resins, latex compounds and asphalts, both as aqueous dispersions and solvent cements.

These materials...designed for standard or special requirements...are supplied either by drum or tank-car.

If some saturating, laminating or bonding requirement is giving you trouble, let us help. Our technical staff will be glad to work right along with you to formulate just what you need. Write us today.

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Akron-Standard stock servicers are made in many sizes. Both sets of stock rolls are connected together by chain drive to sprockets from motors mounted on side of frame.

FOR USE WITH ANY SINGLE OR DUAL BEAD TIRE-BUILDING MACHINE

Akron-Standard stock servicer for truck and tractor tire-building machines.

Another Akron-Standard aid to modern, streamlined production — a stock servicer which supplies material to the tire builder without leaving his position (ideal for women operators). It handles plies, chafers, tread and breaker. No placing of fabric in loose liners — no more unnecessary handling anywhere! Uniform tension makes for a uniform product. The tire builder controls each roll with an index button which operates the motor drive. A limit switch automatically stops the roll. The stock rolls are filled so that each ply comes in proper sequence with the cord angles reversed correctly as applied to the drum. The Akron-Standard stock servicer is ideal for any machine building passenger, truck or tractor tires.

Details. On one side of the upper unit are 12 rolls, six of which carry the self-winding liner and six the stock fabric for the operator. The stock is fed to the rolls at the back. When filled, the turret is turned, permitting the operator to build several more tires before another turn.

Ask for our 40-page Bulletin "W-11", describing this and many other profit-earning types of Akron-Standard equipment.

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The success "secret" in all three of these cases is *planned processing flow.*

Developed from start to finish by Farrel-Birmingham engineers, each of these layouts is composed of production machines *matched in capacity* to prevent the "choking" or "starving" of succeeding units. Production flows without costly interruptions and with manual aid and supervision reduced to a minimum.

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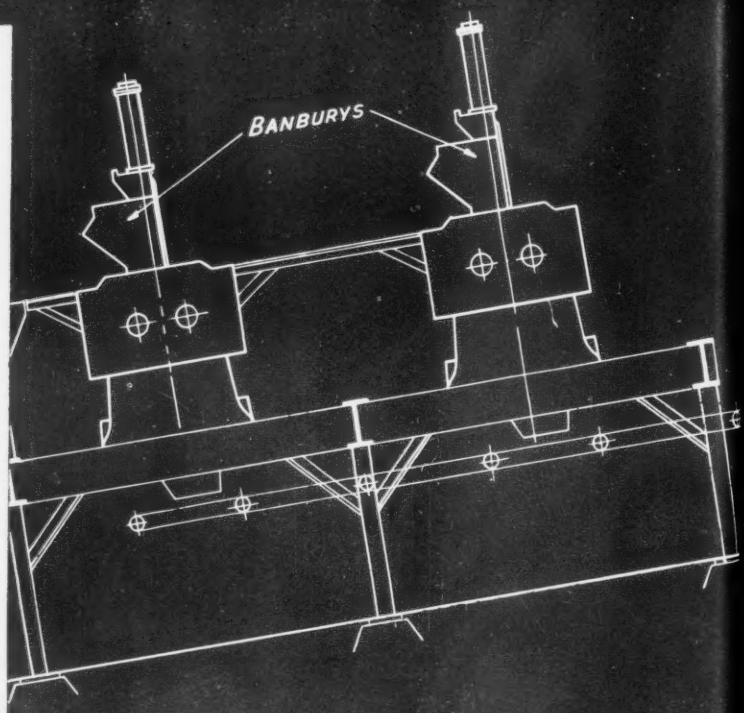
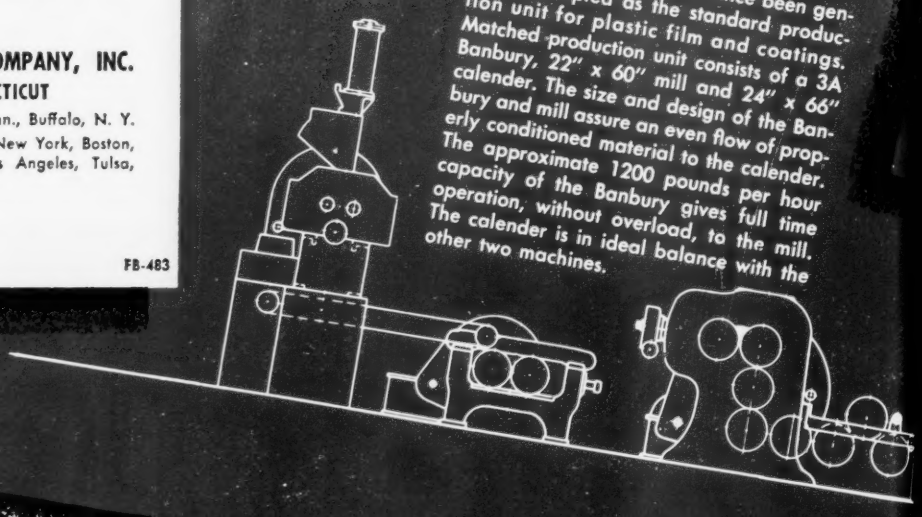


PLASTIC FILM

Originally developed for one producer of plastic film, this setup has since been generally accepted as the standard production unit for plastic film and coatings. Matched production unit consists of a 3A Banbury, 22" x 60" mill and 24" x 66" calender. The size and design of the Banbury and mill assure an even flow of properly conditioned material to the calender. The approximate 1200 pounds per hour capacity of the Banbury gives full time operation, without overload, to the mill. The calender is in ideal balance with the other two machines.



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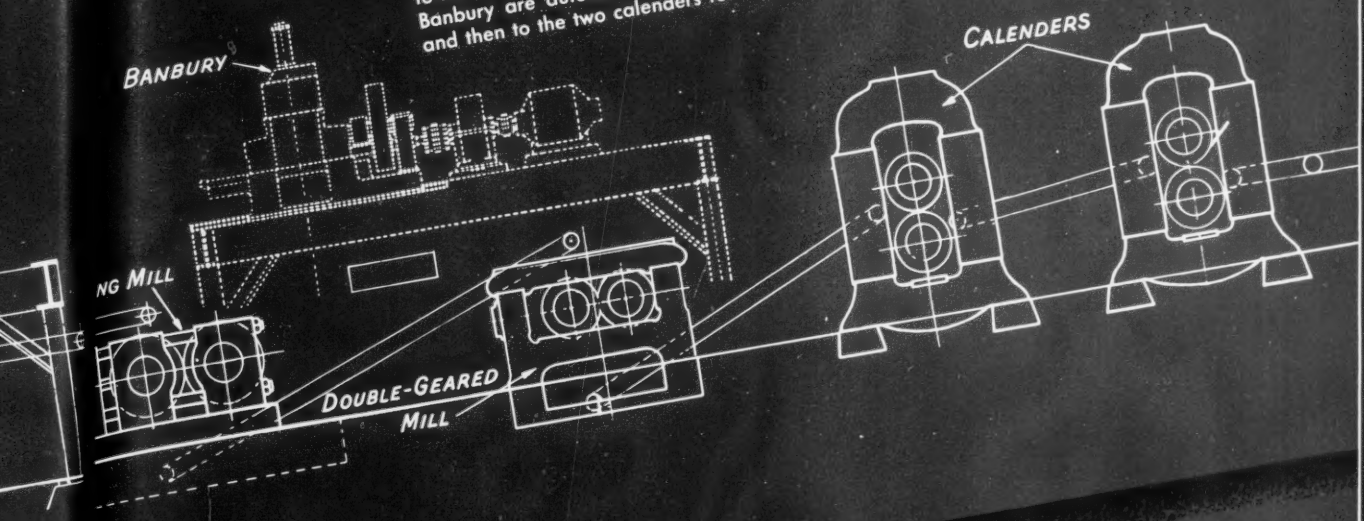
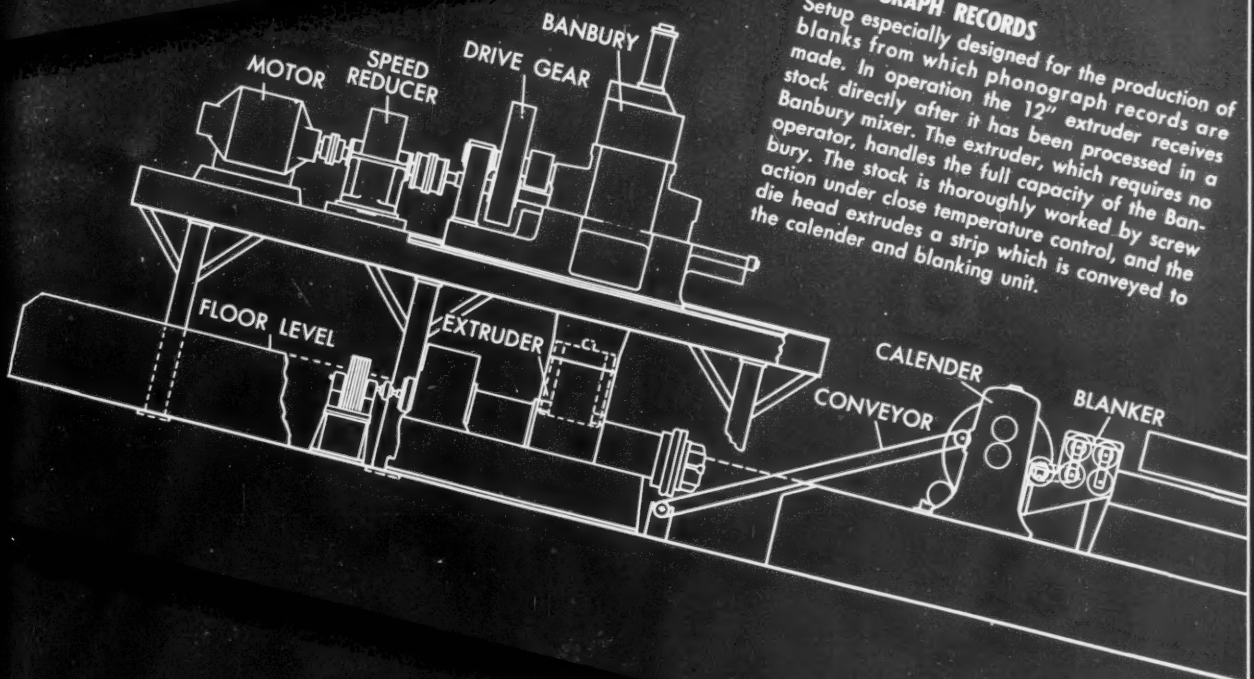
FLOORING

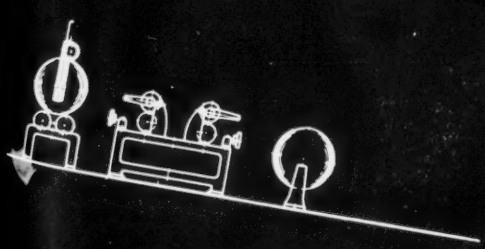
Schematic layout developed to synchronize production through the progressive steps in the manufacture of asphalt tile. The two Banburys discharge mixed stock onto a conveyor which carries it to the sheeting mill. The sheet and the mottle chips from the third Banbury are automatically conveyed to the double-geared mill and then to the two calenders for reduction to final gauge.



PHONOGRAPH RECORDS

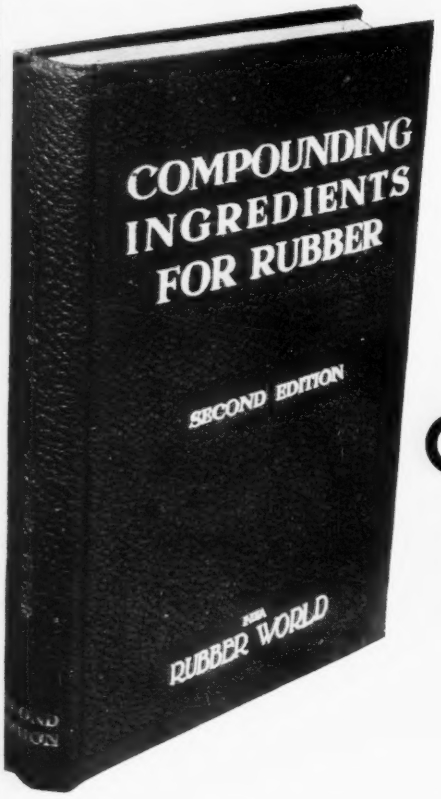
Setup especially designed for the production of blanks from which phonograph records are made. In operation the 12" extruder receives stock directly after it has been processed in a Banbury mixer. The extruder, which requires no operator, handles the full capacity of the Banbury. The stock is thoroughly worked by screw action under close temperature control, and the die head extrudes a strip which is conveyed to the calender and blanking unit.





F-B PRODUCTION UNITS

Banbury Mixers • Plasticators • Pelletizers • Mixing, Grinding, Warming and Sheeting Mills • Bale Cutters Tubing Machines • Refiners • Crackers • Washers Calenders • Hose Machines • Hydraulic Presses • and other equipment for processing rubber and plastic materials.



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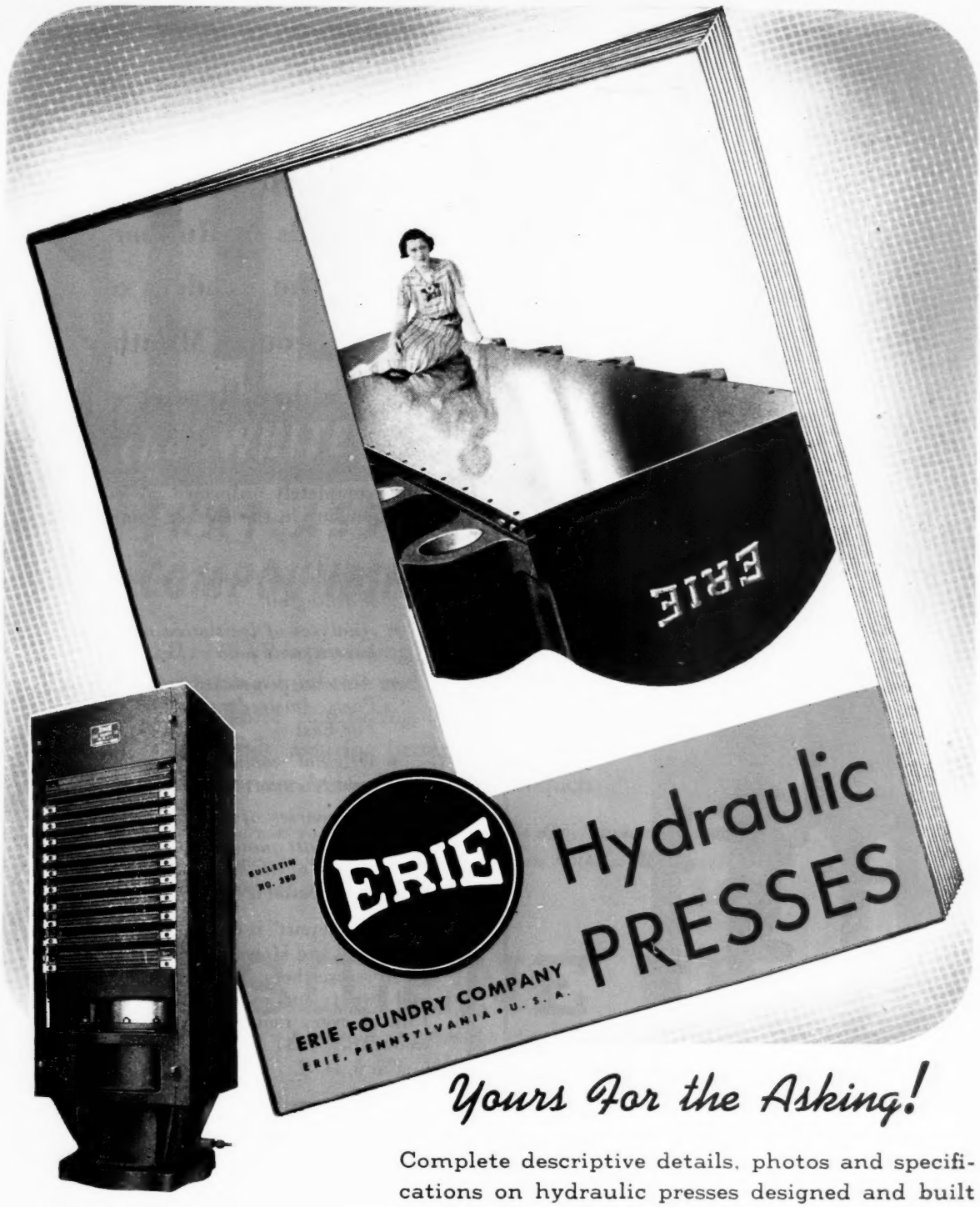

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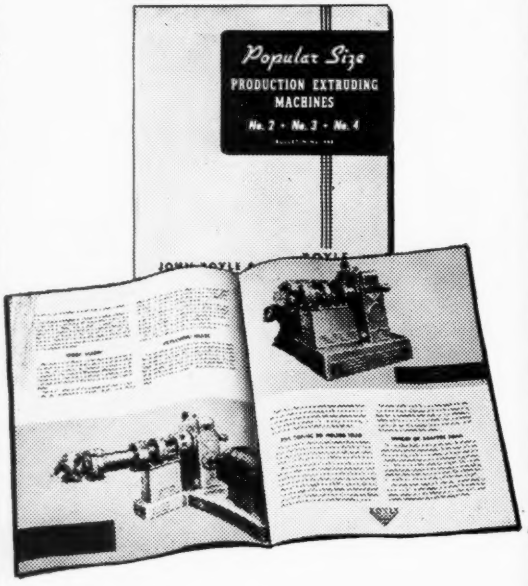

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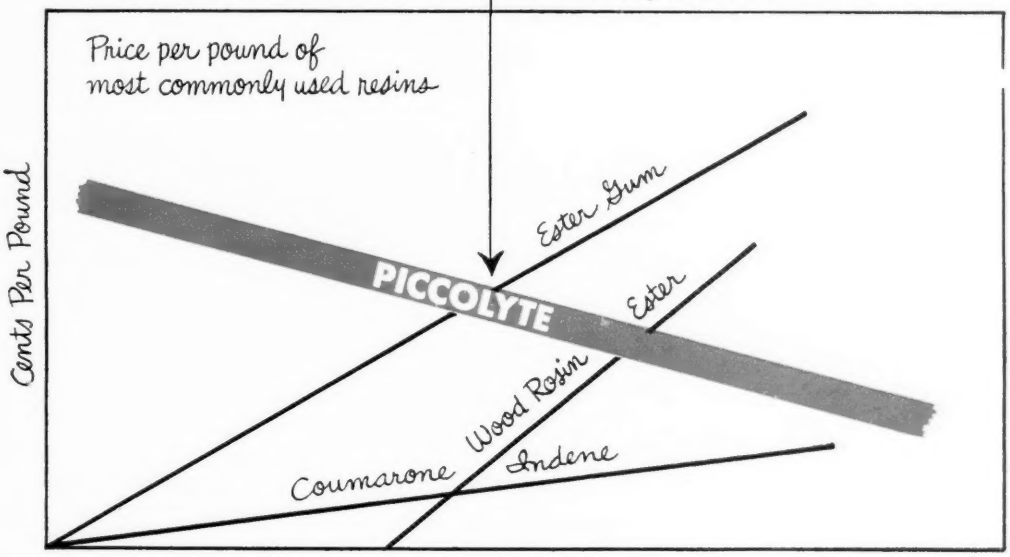

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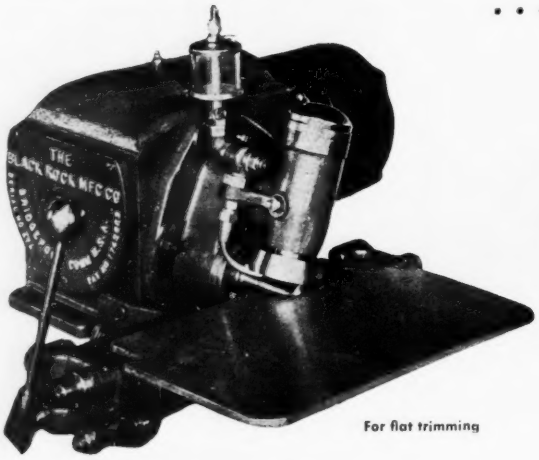

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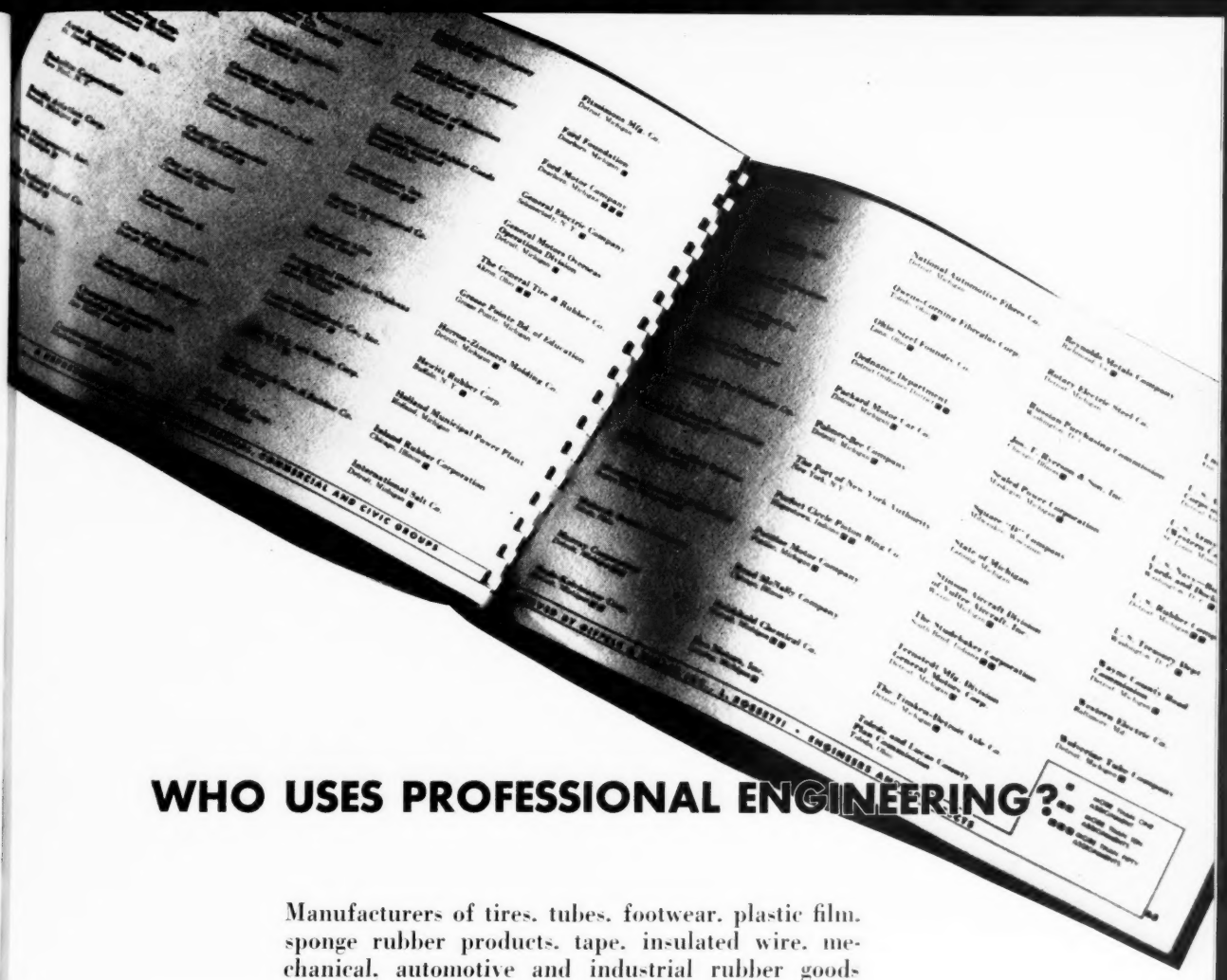

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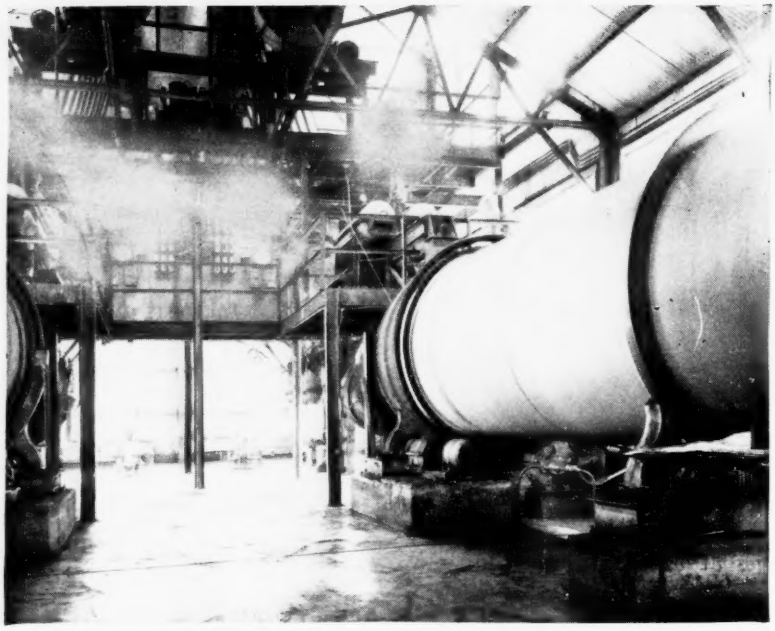

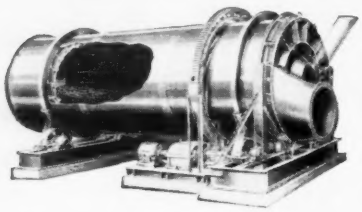

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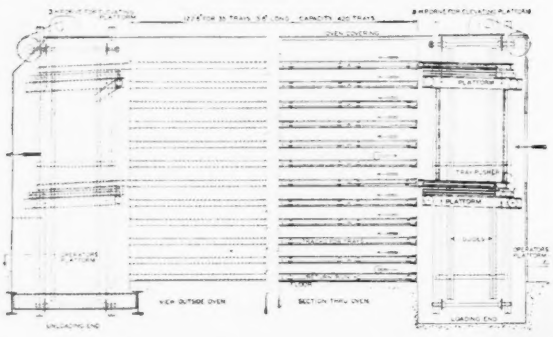

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November, 1948
Volume 119 Number 2

A Bill Brothers Publication

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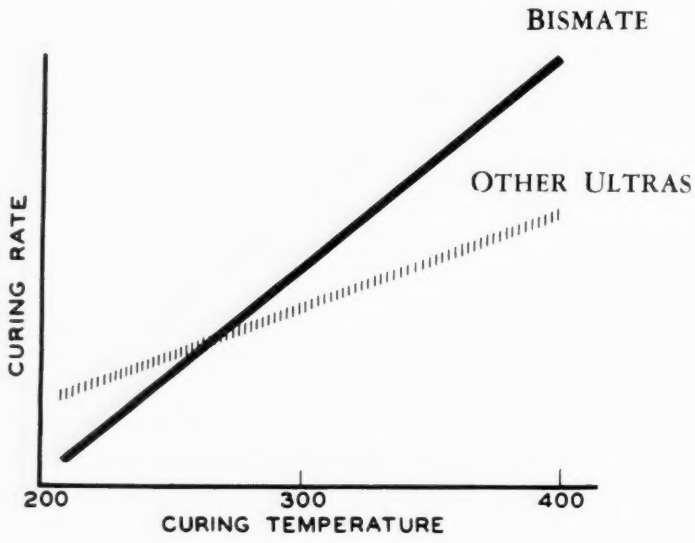

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RUBBER WORLD

Volume 119 | New York, November, 1948 | Number 2

41° F. Low-Temperature Chemical Rubber in Mechanical Goods Applications[1]

L. R. Sperberg[2] and J. F. Svetlik[2]

LOW-TEMPERATURE chemical rubber is, as the name implies, synthetic rubber that has been prepared at polymerization temperatures just above the freezing point of water or in antifreeze systems even below the freezing point of water. The properties of Philprene A[3] and Philprene B,[3] two examples of this rubber prepared at 41 and 14° F., respectively, were described by Schulze *et al.*,[4] using typical tread-type compounds, and the results reported indicated the marked superiority of these new elastomers over the two general-purpose synthetic rubbers—GR-S and GR-S-10.

The commercial production of low-temperature rubber has also been described in detail by W. H. Shearon, Jr., in collaboration with J. P. McKenzie and Martin E. Samuels.[5] Process problems in low-temperature emulsion polymerizations have recently been discussed by J. E. Troyan.[6] In a paper presented before the Division of Rubber Chemistry, A. C. S., Chicago, Ill., April 21, 1948, L. H. Howland, W. E. Messer, V. C. Neklutin, and V. S. Chambers reported data on low-temperature rubber similar to that previously reported by Schulze *et al.*[4]

While an improvement in any of the basic properties of GR-S without a corresponding degrading of some other property would have been hailed as a minor achievement, it should be pointed out that the low-temperature rubbers possess a marked improvement over GR-S in many properties: namely, stress-strain, flex crack growth resistance, decreased hysteresis, and improved processing characteristics, without adversely affecting any of the other properties at all. While the original laboratory work had indicated a possible improvement in abrasion resistance over GR-S besides the other improvements in physical properties, it remained for exhaustive road tests to establish the superiority of approximately 20-40% in this property while contributing in addition to improved flex crack growth performance.[4] As a result of the outstanding performance of Philprene A and B in test tires and because of the superior physical properties of such polymers, it is no small wonder that a great deal of interest has been directed to low-temperature elastomers which will soon be manufactured on a commercial basis to the extent of 183,000 long tons a year.

This interest has extended into many non-tire applications where the possible use of mineral pigments or fillers in the Philprene A type of elastomer is being considered. In addition, the improved processing characteristics of Philprene A type of rubber in comparison to GR-S and natural rubber are an important economic factor.

Processing Characteristics

The improved processing characteristics of Philprene A in comparison to other rubbers may be very readily shown in the laboratory using the midget Banbury technique described in a previous publication.[7] In this procedure a laboratory batch, 1.8 times the formula weight in grams of 100 parts rubber, 50 parts carbon black and variable softener, etc., is mixed in a midget Banbury for a predetermined period of time under conditions of speed and temperature that permit close approximation to the work done in a #11 factory Banbury in a like period of mixing. The superior processing characteristics of Philprene A may be readily seen in Table 1, where various rubbers are compared with a 50 phr loading of EPC black and Philblack[3] O respectively. Since the Philprene A rubber required less Banbury working than other rubbers in order to incorporate the pigment completely, it was felt that less softener might be used with Philprene A than is required for the other rubbers. Therefore a range of zero, two, four, and six parts of softener per 100 parts of elastomer was investigated in addition to the standard 10 phr. By way of contrast some unpremasticated #1 ribbed smoked sheet has been included for comparison.

A study of Table 1 reveals that Philprene A takes up the compounding ingredients much more rapidly than do the other rubbers and under comparable compounding conditions gives lower Mooney value stocks. The tubing

[1] Presented before the Chicago Rubber Group, Chicago, Ill., Sept. 24, 1948.
[2] Phillips Petroleum Co., research department, Phillips, Tex.
[3] A trade mark of Phillips Petroleum Co.
[4] Schulze, Reynolds, Fryling, Sperberg, Troyan, INDIA RUBBER WORLD, Mar., 1948, p. 739.
[5] *Ind. Eng. Chem.*, May, 1948, p. 769.
[6] *Rubber Age (N. Y.)*, Aug., 1948, p. 585.
[7] Sperberg, Svetlik, Bliss, "Rubber Reinforcing Properties of High Abrasion Furnace Black," *Ind. Eng. Chem.*, in press.

TABLE 1. PROCESSING CHARACTERISTICS*

Rubber	Unpremasticated Ribbed Smoked Sheet	Premasticated Smoked Sheet	GR-S (X-346)†	Philprene A				
Softener—PHR	10	10	10	0	2	4	6	10
			EPC Black					
Power-watt hours	667	622	700	703	727	715	680	660
Temperature—° F.	290	283	290	285	295	282	275	290
Black not incorporated—%	4.5	3.9	2.2	0.5	0.5	<0.5	<0.5	<0.5
Mooney viscosity, ML4	106.2	88.5	100.5	96.8	98.7	100.0	95.6	83.4
Extrusion—cc. min.	14.9	43.4	75.6	69.4	70.4	70.8	72.2	73.1
Cc. in.	1.30	1.38	2.33	2.48	2.44	2.58	2.48	2.55
Rating‡§	7+(1+,4−,2+)	9+(2,4−,4−)	11−(4,3+,4−)	10(3,4−,3+)	9(2+,4−,3)	11 (3+,4,4)	10 (3,4−,4)	10(3−,4−,4)
			Philblack O					
Power-watt hours	685	649	738	700	711	722	720	680
Temperature—F.	285	285	270	293	286	295	290	293
Black not incorporated—%	4.5	1.9	0.8	Trace	0	Trace	Trace	0
ML4	115.7	98.7	110.0	99.0	95.0	92.0	87.0	81.5
Extrusion—cc. min.	34.2	48.9	77.8	86.5	89.8	78.3	78.7	83.7
Cc. in.	1.69	1.68	2.18	1.91	1.90	1.97	1.99	1.79
Rating‡§	9(2,4−,3+)	10+(2+,4,4)	11−(4−,4−,3+)	12(4,4,4)	12 (4,4,4)	12 (4,4,4)	12 (4,4,4)	12 (4,4,4)

*Five-minute mixing time, 33 r.p.m. rotor speed, 250° F. jacket temperature.
†Standard Bale GR-S.
‡Garvey ratings for edge, surface and corner, respectively—4 is best rating.
§Garvey, Whitlock, Freeze, *Ind. Eng. Chem.*, 34, 1309 (1942).

rate is considerably higher than for the other rubbers, and the appearance of the extruded surface is also better. The extent of swelling upon extrusion is somewhat greater than for natural rubber, but is lower than for GR-S. The laboratory mixing and extrusion results listed in Table 1 have been verified in many factory trials.

Mineral Pigments in Philprene A

Although straight loadings of mineral pigments in GR-S generally give disappointing stress-strain results, it appeared probable that the use of Philprene A in preference to GR-S would result in greatly improved physical properties. It was anticipated that a comparison of several typical mineral fillers in both GR-S and Philprene A at volume loadings comparable to 10, 30, and 50 parts of carbon black per hundred parts of elastomer would give results that would show the superior properties of Philrene A in this type of application. Four pigments, treated calcium carbonate, zinc oxide, talc, and hard clay, were selected for study since they are typical of the major classes of mineral pigments used by the rubber industry. Prior to the actual evaluation a preliminary study was made to determine the relative accelerator requirements of the different pigments in GR-S and in Philprene A so that curing times to equivalent states of cure would be approximately equal. The final formulae selected as a result of the preliminary work are shown in Table 2. In order to compare the mineral pigments to representatives of the carbon black classes, it was decided to include two carbon blacks, one with a low and one with a medium reinforcement potential.

TABLE 2. BASE RECIPES

GR-S (X-346)	100.0	..
Philprene A	..	100.0
Zinc oxide	2.8	2.8
Phenyl beta naphthylamine	1.2	1.2
Circosol 2XH	2.75	2.75
Paraflux	2.50	2.50
Stearic acid	..	2.0
Sulfur	1.75	1.75
Santocure	variable	variable
Filler	variable	variable

PIGMENT LOADINGS AND ACCELERATOR REQUIREMENTS

	Parts by Weight at			PHR of Santocure in	
	5.55 Vol.	16.65 Vol.	27.75 Vol.	GR-S	Philprene A
Treated calcium carbonate	13.9	41.7	69.5	0.85	1.02
Zinc oxide	30.9	92.8	154.7	1.00	1.20
Talc	15.0	45.0	75.0	0.85	1.02
Hard clay	14.4	43.3	72.2	1.65	1.20
FT Carbon black	10.0	30.0	50.0	0.80	0.95
SRF Carbon black	10.0	30.0	50.0	0.80	0.95

The results have been arranged in three tables and five figures in which a direct comparison is possible between the properties of the various pigments in GR-S with their corresponding properties in Philprene A. Tables 3, 4, and 5 give the comparisons at 5.55, 16.65, and 27.75 volume loadings, respectively; while Figures 1-5 give comparisons of stress strain, resilience, Shore hardness, plasticity, and extrusion properties.

STATE OF CURE. Despite the original effort to balance all the compounds so as to have approximately the same state of cure at equal cure times, the Philprene A compounds (with the exception of the treated calcium carbonate compounds) all cured at slightly faster rates than the corresponding GR-S compounds. The slightly faster rate of cure of the Philprene A compounds may be detected by an examination of the rate of change of the modulus, tensile strength, and % resilience with the change in the time of cure. The method used for determining state of cure was the modified compression set method described previously by this laboratory.[8] The small variation in the state of cure occasioned by variation in rates should not have an appreciable effect upon the ultimate physical properties.

MODULUS. In general the modulus values of the Philprene A compounds are slightly higher than for the corresponding GR-S compounds. At the higher loadings of the two carbons the modulus characteristics of the two rubbers are about equal.

[8] Sperberg, Svetlik, Bliss, Tschirley, "Compression Set—A Relative Measure of State of Cure." Paper presented before Rubber Division, A. C. S., Chicago, Sept., 1946.

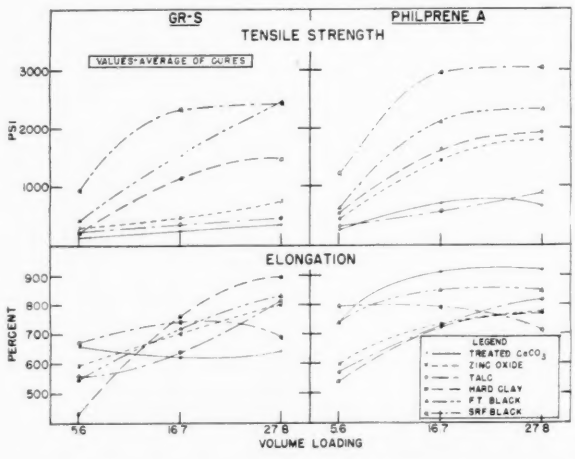


Fig. 1. Tensile Strength and % Elongation, Philprene A *vs.* GR-S with Mineral Fillers and Two Carbon Blacks

TABLE 3. COMPARISON OF VARIOUS PIGMENTS IN GR-S AND PHILPRENE A AT 55 VOLUME LOADING

Min. Cure at 307° F.	GR-S (X-346)						Philprene A						GR-S (X-346)						Philprene A					
	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black
	ORIGINAL PROPERTIES												OVEN AGED 24 HOURS AT 212° F.											
	300% Modulus												300% Modulus											
20	..	90	40	120	100	170	50	120	130	200	60	60	80	130	130	200	..	..	60	180	150	390	100	180
30	..	120	100	180	100	210	..	140	200	220	60	100	..	..	..	200	..	430	210	190	160	270	70	180
45	..	150	130	180	100	200	..	120	220	220	40	160	..	120	140	200	..	..	90	170	220	340	90	210
75	..	140	140	110	150	200	..	130	210	220	90	110	..	80	170	130	200	340	130	140	130	260	100	160
	Ultimate Tensile												Ultimate Tensile											
10	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	530	UC	UC	UC	UC	UC	790	840
20	140	380	290	270	450	1190	250	375	290	380	840	1330	120	250	180	280	..	..	190	200	210	440	310	1000
30	150	260	240	200	440	950E	250	490	320	650	710	1480	80	100	190	240	240	480	260	340	270	280	200	770
45	110	250	250	240	400	890	290	490	340	580E	520E	1750E	100	170	220	260	..	..	190	220	270	390	330	1100
75	100	300	240	230	400	640	340	430	320	530	400	860	150	160	220	200	320	570	280	250	260	530	450	650
	% Elongation												% Elongation											
10	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	1400	UC	UC	UC	UC	UC	1100	UC	UC	UC	..C	UC	960	930
20	845	790	795	530	640	850	800	600	650	490	885	915	420	440	395	325	..	..	500	350	380	320	460	600
30	610	550	535	350	565	670E	710	600	550	600	775	820	360	280	345	340	295	310	405	410	380	305	400	515
45	575	530	445	420	505	640	700	595	570	550E	750	750E	385	360	405	330	..	..	420	355	345	330	450	590
75	600	490	470	420	500	530	700	580	520	520	620	690	500	400	400	350	355	420	520	410	450	460	570	560
	% Resilience												% Resilience											
20	UC	45.3	53.5	68.3	56.8	60.5	60.7	74.3	68.0	77.6	70.3	66.4	75.5	..	81.5	83.9	82.6	82.5	80.1	86.6	85.2	86.8	83.4	82.8
30	65.9	72.1	69.3	75.2	70.2	71.7	72.9	80.0	77.5	83.0	73.0	75.2	76.3	82.2	79.9	81.5	80.7	79.9	78.9	84.9	81.0	85.3	82.8	81.3
45	67.2	74.5	71.1	74.9	71.2	73.1	75.4	81.1	79.1	82.6	78.4	77.2	71.4	79.9	75.9	79.3	78.5	78.2	78.8	83.6	83.4	84.4	80.1	79.8
75	65.6	74.5	70.0	74.6	71.4	73.3	73.7	80.2	78.8	81.0	77.2	77.7	68.6	76.7	73.8	76.8	76.3	75.1	76.7	81.0	79.7	82.1	78.0	87.7
	Flex Life												Flex Life											
30	0.4	<0.1	<0.1	<0.1	<0.1	1.5	1.3	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
45	0.4	<0.2	<0.2	<0.2	<0.1	0.5	0.6	<0.2	<0.2	<0.1	<0.3	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.3	<0.1	<0.1	<0.1	<0.2	<0.2
75	0.4	<0.1	<0.1	<0.1	<0.2	0.7	0.7	<0.1	<0.1	<0.1	<0.3	0.3	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2
	Shore Hardness												Shore Hardness											
30	34	38	37	40	40	39	37.5	42	40.5	42.5	40	40	39.5	43.5	43	45	45	46	44.5	47.5	46	48.5	43	44
45	35	39	38	40.5	41	40	38	43	41	43	41	41.5	37.5	42	42	43	44	44	43.5	46.5	45	47.5	42	43
75	35	39	38	41.0	41.5	40.5	38.5	44	40	44	41.5	42	35	40	40	42	43	43	42	45.5	44	46.5	41	42
	% Compression Set												% Compression Set											
10	..	..	..	..	..	..	88.9	89.0	82.2	86.8	..	..	11.6	7.0	7.5	6.8	6.8	7.2	9.1	5.3	6.4	5.2	5.8	5.5
20	45.6	61.8	94.4	87.4	67.3	68.2	49.8	36.3	41.0	30.0	45.0	43.9												
30	25.8	35.5	51.5	37.4	27.8	31.2	30.8	18.1	22.8	15.6	22.9	25.6												
45	16.9	21.0	27.2	16.3	16.6	16.0	17.7	9.9	12.3	10.4	11.8	11.8												
75	11.7	10.8	17.4	8.6	8.5	8.8	9.5	5.4	6.9	7.0	5.3	5.9												
	Compound Mooney (MS 1½)																							
	24	23	21.5	20.5	23.5	24.3	27.5	29.5	28.5	27.5	25.0	26.5												
	Minutes to Scorch																							
At 307° F.	17.5	18.75	18.25	17.0	+14.5	..	16.5	14.	15.2	14.2	9.75	10.0												
280° F.	39.5	41.5	39.5	33.75	33.5	<20	34.5	26.5	32.8	29.0	21.5	23.0												
	Extrusion																							
Cc/min.	64.1	74.1	64.1	60.9	62	60.7	79.1	76.3	77.1	68.6	86.5	84												
Rating	9–	8–	9–	9+	7+	7+	10+	10+	8	9+	11–	11												
Cc's/in.	2.83	2.67	2.46	2.66	2.48	2.48	2.91	2.72	2.42	2.53	3.53	3.37												

TENSILE STRENGTH. The greatest difference in properties was evidenced in the ultimate tensile strength values which generally showed a tremendous improvement for the Philprene A elastomer as compared to GR-S. By the use of Philprene A, tensile strength values in the neighborhood of 2,000 p.s.i. are possible with zinc oxide and hard clay reinforcement at 27.75 volume loading; whereas in GR-S the maximum tensile strength at the same loading with zinc oxide ran to less than half this amount. With hard clay the maximum tensiles were reduced by from 100 to 400 p.s.i. While the maximum tensile strengths obtained with calcium carbonate and with talc do not approach the values obtained with zinc oxide and hard clay, the relative improvement

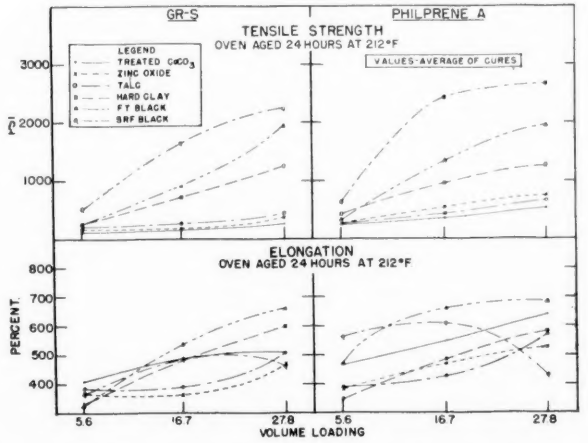


Fig. 2. Tensile Strength and % Elongation after Aging. Philprene A *vs.* GR-S with Mineral Fillers and Two Carbon Blacks

TABLE 4. COMPARISON OF VARIOUS PIGMENTS IN GR-S AND PHILPRENE A AT 16.65 VOLUME LOADING

Min. Cure at 307° F.	GR-S (X-346)						Philprene A					
	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black
ORIGINAL PROPERTIES												
300% Modulus												
20	..	..	..	130	170	430	..	100	50	290	150	270
30	70	100	130	230	200	510	..	210	150	360	210	380
45	90	170	180	240	200	560	..	210	200	370	200	440
75	..	160	170	200	200	510	..	200	200	340	180	470
Ultimate Tensile Strength												
10	UC	UC	US	UC	UC	UC	UC	UC	UC	UC	1130	1170
20	260	600	490	820	2110	2600	720	1520	730	1730	1950	2950
30	320	480	350	1310	1630	2600	760	1560	650	1600	2160	3270
45	270	410	360	1280	1200	2230E	720E	1350	490	1600	2140	2900
75	200	440	340	1090	1250	1890	660	1200	470	1610	2200	2620
% Elongation												
10	UC	UC	UC	UC	UC	UC	UC	UC	UC	UC	1160	1590
20	665	960	960	850	880	890	985	815	940	760	900	915
30	675	680	520	740	765	780	915	735	740	700	840	815
45	605	575	510	720	690	735E	905E	700	600	700	840	770
75	565	590	550	725	735	680	855	675	600	715	815	765
% Resilience												
20	62.4	53.8	50.6	59.2	63.0	61.1	62.3	69.9	64.4	71.3	70.2	66.5
30	65.9	64.9	67.0	68.1	68.1	69.0	66.9	74.7	73.2	76.3	72.3	70.0
45	66.9	69.3	69.8	69.1	68.9	70.2	69.8	76.4	76.2	75.8	74.9	73.7
75	64.8	70.8	68.5	68.6	68.5	69.3	70.0	75.7	76.1	75.7	74.8	73.4
Flex Life												
30	1.7	<0.2	<0.2	0.3	0.7	2.1	5.0	<0.2	<0.1	0.5	6.4	5.0
45	1.2	<0.2	<0.2	0.4	0.7	1.6	2.7	<0.2	<0.2	0.5	1.9	2.3
75	0.8	<0.1	<0.1	<0.1	0.8	1.6	2.8	<0.1	<0.1	0.2	2.0	3.7
Shore Hardness												
30	40.5	42.5	45	46	45	48	41.5	48.5	48	50.5	45	48
45	40.5	45	45.5	47	44	48.5	42.5	49	49	51	45.5	49
75	40	45	46	47	43	48.5	44	50	49.5	52	45.5	49.5
Extracted Abrasion Loss (cc's)												
35	25.59	23.72	42.23	24.49	27.7	10.52	23.90	31.82	53.92	28.78	18.89	13.41
% Compression Set												
10	..	..	..	..	..	UC	84.1	89.8	91.3	86.5	..	..
20	64.7	67.1	80.1	73.9	56.7	53.5	45.4	31.8	47.2	36.6	34.2	37.7
30	28.6	34.0	41.6	30.2	24.1	26.3	27.0	18.9	25.9	19.2	18.8	20.4
45	16.7	17.8	23.2	15.8	14.3	14.2	17.7	10.6	15.4	11.2	10.3	10.8
75	10.9	8.0	13.7	9.4	8.1	8.1	9.0	6.4	11.2	8.6	6.2	5.4
Compound Mooney (MS $1\frac{1}{2}$)												
	26	25	22	20.5	24.0	26.0	31	32.5	29	30	27.5	31
Minutes to Scorch												
At 307°F	15.0	16.0	16.5	18.5	12.0		17	12.5	16+	14.5	8.25	8.75
280°	39.5	43.5	40.5	46.0	26.5	>20	36.5	20.0	29.5	29	18.0	18.5
Extrusion Properties												
Cc's/min.	61.7	60.1	61.3	57.8	63	63.1	71.4	77.9	77.4	70.6	85.5	80.3
Rating	9	11-	10	10	7+	10	10	10	8	11-	11+	11
Cc's/in.	2.57	2.72	2.34	2.46	2.42	2.74	2.64	2.50	1.94	2.59	3.22	3.03

Min. Cure at 307° F.	GR-S (X-346)						Philprene A					
	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black
OVEN AGED 24 HOURS AT 212° F.												
300% Modulus												
20	120	..	190	330			80	240	340	550	300	660
30	90	..	230	400	400	900	130	230	280	490	330	690
45	..	140	240	370			180	240	340	380	300	700
75	..	..	210	230	330	740	100	140	220	330	110	600
Ultimate Tensile Strength												
10	UC	UC	UC	UC	1330	UC	UC	UC	UC	UC	2400	2800
20	190	140	280	540			290	560	420	1000	1370	2710
30	150	160	290	680	910	1730	300	660	420	800	990	2000
45	180	210	290	830			260	330	400	890	1120	2120
75	160	230	280	780	920	1620	490	550	430	1070	2000	2820
% Elongation												
10	UC	UC	UC	UC	780	UC	UC	UC	UC	UC	800	870
20	425	390	415	440			520	460	400	465	610	640
30	455	320	300	430	500	440	580	500	450	410	570	550
45	510	340	345	495			445	365	355	470	600	580
75	530	400	405	560	580	530	675	560	510	600	850	670
% Resilience												
20	74.1	81.2	79.5	80.8	90.8	79.7	74.5	83.2	81.3	82.3	80.4	78.7
30	72.3	79.5	76.8	77.1	77.7	77.6	71.9	82.2	81.0	80.6	79.4	77.4
45	71.4	77.3	75.3	74.4	75.8	76.2	72.6	80.0	78.6	79.4	78.0	76.7
75	68.9	75.6	72.0	73.2	73.9	73.4	71.5	77.3	76.6	77.6	76.2	74.9
Flex Life												
30	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.1	<0.1	0.2	0.4	0.4
45	<0.2	<0.1	<0.1	<0.1	<0.2	0.1	0.3	<0.1	<0.1	<0.3	0.4	0.4
75	<0.2	<0.1	<0.1	<0.1	0.7	0.4	0.4	<0.1	<0.1	<0.1	0.8	0.8
Shore Hardness												
30	44.5	50	52	53	50	54	48	53	53	55.5	49	53
45	43	49	50	51.5	49	52	47	52	52	54.5	47	51.5
75	42	47.5	49	50	48	49	46	50.5	51	53.5	45	50
Extracted Abrasion Loss (cc's)												
35	29.00	43.08	60.26	33.65	27.30	13.60	26.00	31.42	52.53	27.50	23.45	14.50
% Compression Set												
10	13.8	8.9	12.2	10.1	6.9	7.1	14.2	5.0	10.3	8.0	5.6	5.5

effected by the use of Philprene A ranges from a moderate increase of 50% to a maximum of approximately 250%. Both carbon blacks in Philprene A exhibited the same improvement shown by the mineral pigments and impart higher tensile strengths than the best of the fillers (Figures 1 and 2).

% ELONGATION AT BREAK. Although the Philprene A compounds are at a higher state of cure than the GR-S compounds, the elongations at break are, in most cases, greater than those exhibited by the GR-S compounds (Figures 1 and 2).

% OF RESILIENCE. The Philprene A compounds all

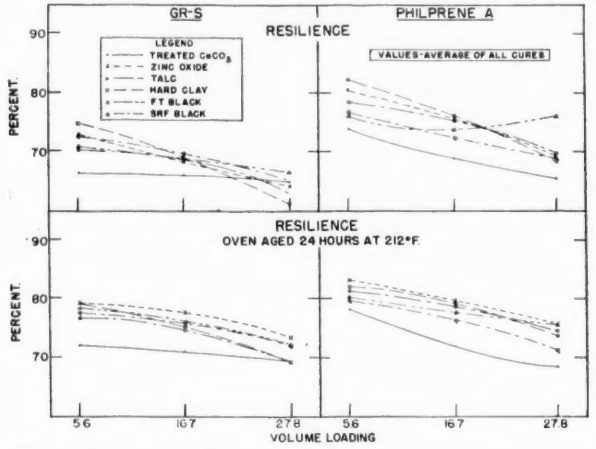


Fig. 3. Original and Aged Resilience, Philprene A *vs.* GR-S with Mineral Fillers and Two Carbon Blacks

TABLE 5. COMPARISON OF VARIOUS PIGMENTS IN GR-S AND PHILPRENE A AT 27.75 VOLUME LOADING

Min. Cure at 307° F.	GR-S (X-346)						Philprene A					
	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black
					ORIGINAL PROPERTIES							
					300% Modulus							
20	80	..	..	..	260	780	..	100	..	250	140	610
30	110	110	160	190	340	900	..	130	230	370	230	710
45	100	90	250	240	350	1000	..	160	280	430	240	860
75	60	90	240	260	350	920	..	200	270	400	260	1510
					Ultimate Tensile Strength							
10	UC	UC	UC	UC	800	570	UC	UC	UC	UC	UC	1050
20	340	1040	370	820	2527	2370	670	1730	840	1785	2440	2750
30	320	880	560	1800	2400	2390	700	2060	1090	2250	2390	3240
45	300	570	480	1610	2420	2520	680	1660	830	1710	2250	2930
75	350	510	470	1400	2360	2380	600	1750	810	1870	2380	3160
					% Elongation							
10	UC	UC	UC	UC	1550	1000	UC	UC	UC	UC	1600E	1200
20	640	1150	1250	1120	895	795	980	890	975	925	950	790
30	625	800	745	880	870	680	915	770	810	760	815	770
45	635	650	655	810	800	645	900	715	735	700	800	690
75	670	600	600	765	820	645	840	715	745	700	830	585
					% Resilience							
20	62.6	52.4	..	47.5	61.8	62.1	58.9	59.2	60.1	60.7	77.9	64.2
30	65.1	60.1	58.9	59.9	65.7	64.6	63.4	67.0	66.3	67.2	77.0	68.7
45	64.8	64.7	65.1	61.9	67.6	66.0	66.4	70.3	71.1	69.0	77.5	69.2
75	64.0	67.7	63.7	60.9	66.0	65.1	66.9	70.0	71.2	68.4	74.2	68.7
					Flex Life							
30	0.7	1.1	0.8	5.9	5.2	11.3	4.5	0.7	0.9	2.6	9.6	20.9
45	0.9	<0.2	<0.1	2.0	3.1	8.2	4.0	0.3	0.5	2.3	5.4	6.9
75	1.1	<0.1	<0.1	1.1	3.4	5.2	4.8	0.3	0.5	1.8	6.0	9.8
					Shore Hardness							
30	42.5	44.5	47.5	47.5	50	54	46.5	52.5	54.5	55	47.5	54.5
45	43	47.5	49.5	51	49.5	54.5	47.5	53	55.5	56	48	55.5
75	43.5	49.5	50.5	50	48.5	55	47.5	54	55.5	57	49	56.5
					Extracted Abrasion Loss (cc's)							
35	25.20	21.53	42.80	22.52	23.32	9.00	21.92	25.32	47.70	26.45	23.95	10.02
					% Compression Set							
10	..	..	..	..	..	97.0	78.3	83.3	89.5	82.9	89.0	85.9
20	45.6	61.8	94.4	87.4	46.3	44.3	37.9	35.6	48.8	43.3	41.6	36.9
30	25.8	35.5	51.5	37.4	22.3	22.1	25.2	21.1	32.0	22.6	19.4	18.4
45	16.9	21.0	27.2	16.3	13.2	13.1	18.0	11.4	18.2	12.6	10.6	9.6
75	11.7	10.8	17.4	8.6	7.9	7.2	10.3	5.5	13.2	8.4	6.4	5.5
					Compounded Mooney (MS 1½)							
	27	27	24	22.5	25.0	29.5	32.5	34	31	31.5	28.5	33.5
					Minutes to Scorch							
At 307°F	14.5	14.0	17.5	16.0	10.0	..	15.5	13.2	15.5	14	9.5	8.5
280°F	34.5	39.0	41.0	36.5	22.25	19	31.2	27.5	26.5	28	13.0	17.5
					Extrusion Properties							
Cc/min.	59.9	61.8	62.0	58.1	67.5	64.6	76.6	76.6	75.2	65.9	77.6	87.3
Rating	10+	11+	11	10+	9	11+	10−	11+	8	11	11+	12
Cc's/in.	2.60	2.63	2.23	2.53	2.72	2.71	2.65	2.70	1.87	2.23	3.00	2.54

	GR-S (X-346)						Philprene A					
	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black	Treated $CaCO_3$	Zinc Oxide	Talc	Hard Clay	FT Black	SRF Black
					OVEN AGED 24 HOURS AT 212° F.							
					300% Modulus							
	130	140	80	380	..	..	100	220	370	580	..	..
	100	190	310	470	490	1540	120	200	320	520	400	1350
	140	190	280	420	..	..	110	220	430	490	..	..
	120	210	310	430	450	1340	110	250	280	420	290	2420
					Ultimate Tensile Strength							
	UC	UC	UC	UC	1920	1970	UC	UC	UC	UC	2370	2860
	220	450	480	1510	..	..	440	840	660	1150	..	..
	210	400	390	1280	1790	2120	740	890	830	1770	1740	2270
	270	280	380	1100	..	..	380	470	520	800	..	..
	280	320	440	1080	2120	2360	560	880	730	1390	2190	3100
					% Elongation							
	UC	UC	UC	UC	750	580	UC	UC	UC	UC	940	740
	430	565	700	665	..	..	600	550	565	505	..	..
	490	500	380	570	605	405	730	550	600	630	620	470
	525	400	450	570	..	..	530	460	410	400	..	..
	570	395	490	595	720	515	695	560	615	615	750	400
					% Resilience							
	72.9	74.9	74.5	73.8	75.3	75.1	68.7	77.6	77.3	77.4	77.9	75.7
	72.1	74.5	69.2	71.9	74.5	73.5	68.5	77.0	75.8	75.4	77.0	73.9
	69.5	73.6	70.8	70.0	72.0	72.9	68.5	75.3	75.0	73.0	75.5	71.5
	66.7	71.9	67.4	65.4	70.2	69.5	68.5	73.7	73.1	72.5	74.2	68.5
					Flex Life							
	<0.2	<0.1	<0.1	<0.1	1.5	0.5	0.7	<0.1	<0.2	1.4	1.3	0.8
	<0.3	<0.1	<0.1	<0.3	1.0	0.8	0.5	<0.1	<0.1	0.7	1.1	1.6
	<0.6	<0.1	<0.1	<0.5	2.3	1.7	0.6	<0.1	<0.1	0.3	2.1	1.8
					Shore Hardness							
	46	54	56	58	55	60	52	57	58	60	54	60
	45	53	55	57	54	57.5	51	56	57	59	53	59
	44	52.5	54	55.5	52.5	55.5	50	55	56	58	52.5	58
					Extracted Abrasion Loss (cc's)							
	29.04	28.58	64.52	30.64	23.35	9.05	22.44	25.00	51.92	23.74	26.60	9.41
					% Compression Set							
	13.8	11.3	18.0	12.4	6.8	6.9	14.4	7.0	13.6	9.6	5.4	4.6

show markedly higher resilience values than the GR-S compounds and approach natural rubber in this respect (Figure 3).

FLEX LIFE. The flex life properties determined at 210° F. and 180-degree bending angle are all poor even at the highest loadings, but the data do show that the Philprene A rubber possesses better flex life properties than GR-S rubber.

SHORE HARDNESS. The Philprene A compounds ranged from one point to five points higher in hardness than the corresponding GR-S compounds (Figure 4).

MISCELLANEOUS PROPERTIES. The abrasion losses

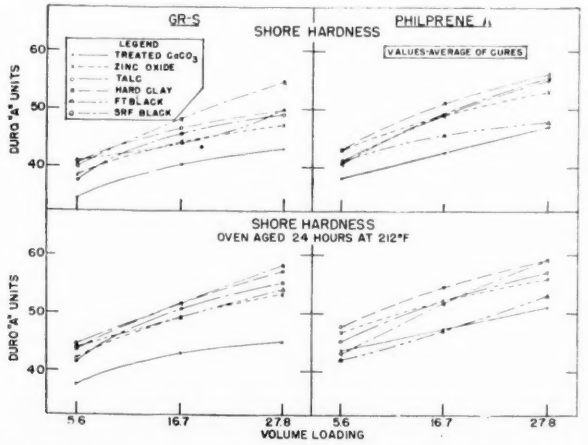


Fig. 4. Original and Aged Shore Hardness, Philprene A *vs.* GR-S with Mineral Fillers and Two Carbon Blacks

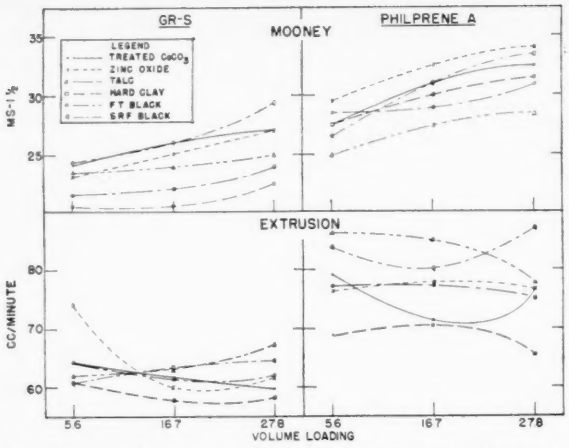


Fig. 5. Mooney Viscosity and Extrusion, Philprene A *vs.* GR-S with Mineral Fillers and Two Carbon Blacks

were determined on a modified Goodyear angle abrader and in general show a slight advantage for the GR-S rubber. Of interest is the comparison of the mineral fillers to P-33 carbon black which shows P-33 to be only slightly superior to some of the mineral pigments in this property. The compounded Mooney viscosities are higher for the Philprene A compounds; while the scorch time is somewhat less and would be associated with the faster curing characteristics of the Philprene A compounds which could be corrected by a lower curative dosage. The extrusion characteristics of the Philprene A compounds are superior to the GR-S compounds both in the rate of extrusion and in the appearance of the extruded sections (Figure 5).

TABLE 6. PROPERTIES OF PHILPRENE A COMPOUNDS AT LOW LOADINGS OF PHILBLACK O

Min. Cure at 307° F.	Original 10 PHR	Original 30PHR	Oven Aged 24 Hrs. at 212° F. 10 PHR	Oven Aged 24 Hrs. at 212° F. 30 PHR
	300% Modulus			
20	100	450	280	1110
30	100	530	280	1270
45	100	680	280	1280
75	100	680	200	1600
	Tensile Strength			
10	UC	1710	1330	4490
20	1640	3300	1310	3270
30	1550	3980	1240	3710
45	1500	3720	1200	3190
75	1320	3330	1230	3290
	% Elongation			
20	910	780	560	525
30	750	735	500	550
45	730	700	500	500
75	690	615	560	560
	% Resilience			
20	66.8	63.9	80.1	73.3
30	72.9	68.2	79.8	73.5
45	76.0	69.7	78.1	71.9
75	76.0	69.7	76.0	70.7
	Flex Life			
30	0.7	7.4	0.2	2.4
45	0.8	7.8	0.2	2.9
75	0.7	7.8	0.3	4.2
	Shore Hardness			
30	42	51	45	55
45	43	52	44	54
75	43	53	43	53
	Abrasion Loss (cc)			
35	..	5.99	..	5.47
	% Compression Set			
10	..	..	..	..
20	40.8	28.5	..	..
30	24.7	16.5	5.5	5.7
45	11.8	9.3	..	..
75	6.3	4.8	..	..
	Compounded Mooney (MS 1½)			
	26.5	35.5		
	Minutes to Scorch			
At 307° F.	9.5	6.75		
280° F.	17.8	13.0		
	Extrusion Data			
Cc/Min.	85.5	83.6		
Cc/In.	3.22	2.79		
Rating	11(3+,4, 4-)	11(3+,4, 4-)		

The improvement in overall physical properties of mineral filler reinforced compounds by the replacement of Philprene A for GR-S rubber has been shown as expected, but the low tensile strength values of some of the mineral fillers might still preclude the use of synthetic rubber in these applications if other means of improving the tensile strength of synthetic rubber were not available. Since early work with Philprene A rubber had indicated a high level of reinforcement potential with low loadings of Philblack O, some additional work was undertaken to determine the physical properties of Philblack O at 10 and 30 phr loading in Philprene A. The same basic type of recipe was employed as in the mineral fillers investigation at an accelerator level of 0.95 phr. The results are reported in Table 6.

The exceptionally high tensile strength obtained with the low loadings of HAF black in Philprene A coupled with the other improvements in processing and in aging characteristics makes this combination an ideal starting source to formulate high-quality low-cost compounds containing appreciable volume loadings of mineral fillers in conjunction with small amounts of HAF black. Although such compounds are not included as a part of this paper, the general knowledge of the fundamentals of compounding indicate the validity of such a conclusion from the data discussed.

Conclusions

The improved processing properties of Philprene A, a low-temperature butadiene-styrene rubber, have been presented and compared to GR-S. Philprene A incorporates carbon black much more rapidly than the other elastomers investigated and gives a smoother, better looking compound. The contention that the excellent physical properties of carbon black reinforced Philprene A rubber also would be evident in mineral pigment reinforced compounds has been substantiated. Philprene A mineral filler compounds give markedly higher tensile strengths, better elongations, higher resiliences, and better extrusion properties than similar GR-S compounds. Low loadings of Philblack O, an HAF black, in Philprene A containing from 10 to 30 parts of Philblack O are recommended as a base to which large volumes of mineral fillers may be added to give high-quality low-cost compounds.

The authors wish to express their appreciation to members of the rubber evaluation laboratory staff and the research department who assisted in collecting the experimental data.

DATA FROM THE SECRETARIAT OF THE RUBBER STUDY GROUP include a comparison of planted acreages in Malaya in 1940 and 1946. In the former year the total area under rubber came to 3,463,795 acres, and included 51,711 acres in Singapore. Estates accounted for 2,112,851 acres, of which 30,558 acres were in Singapore; at the same time small holdings covered 1,350,994 acres, including 21,153 in Singapore. In the course of the year 9,685 acres were transferred from estates to small holdings.

Returns for 1946 give a gross total of 3,461,123 acres, including 33,392 acres in Singapore, and a net total of 3,248,642 acres as the combined acreage of estates and small holdings in that year.

The acreage of the small holdings was reduced to 1,340,589 acres by the loss of 20,040 acres cut out during the Japanese occupation. The 1946 figures give the gross total for estate acreages as 2,100,494 acres. After allowing for 101,255 acres cut out during the Japanese occupation; 29,953 acres abandoned during 1946; 51,218 acres representing acreages of estates in Johore from which returns were not received; and 10,015 acres representing acreages of estates in Singapore from which returns were not received, the net figure of 1,908,053 acres is obtained.

Testing of GR-S Polymers for Pigmenting, Discoloring, and Staining Properties

F. L. Moses[1] and A. L. Rodde[1]

THE increased use of non-staining antioxidants in GR-S polymers has made necessary the development of techniques to determine the pigmenting, discoloring, and staining characteristics of such materials. These properties may be defined briefly as follows: (a) pigmentation—the color common to the unexposed, cured compound; (b) discoloration—the color developed in the cured compound upon exposure to ultra-violet light; (c) staining—the color imparted to adjacent material of a non-staining type which is in direct contact with the cured compound. Although a variety of testing procedures is presently in use, it was believed desirable to incorporate the best features of these methods into a single procedure with which reliable and reproducible test data could be obtained. With this thought in mind an exposure cabinet utilizing ultra-violet sun-lamps was constructed, and the use of various lacquers and testing variables evaluated.

A complete description of the exposure cabinet, along with a more complete definition of terms and identification of materials, appears in the section entitled, "Procedure for Test," which is given at a later point in this paper. Briefly stated, however, the exposure cabinet consists of a circular steel plate that revolves at a speed of approximately one revolution per minute. The polymer samples, compounded in a white formula and coated for one-half their length with white lacquer, are placed around the circular plate with the ends pointing toward the center. Two circular steel rings, each one inch wide, cover the specimens in such a manner that one inch of the lacquered area and one inch of the unlacquered area are exposed to the ultra-violet light while the remaining surfaces are protected from the light. The source of ultra-violet light consists of two sun-lamps mounted above the specimens.

Development of the Exposure Test

Preliminary tests with the exposure cabinet disclosed that the adjustment of lamp height between 15 and 25 centimeters above the plate had very little effect on the amount of discoloration and staining produced. In addition a specimen exposed in either the cabinet or a Fade-Ometer (Type FBA) showed similar exposure effects. Therefore the lamp height was set at 20 centimeters for the remainder of the study.

Exposure Time

In order to determine the optimum exposure time a sample of GR-S containing an amine-type antioxidant (highly staining and discoloring) and a sample of standard polymer (unstabilized regular GR-S derived from sodium sulfide shortstopped latex, which shows minimum staining and discoloration) were compounded in a white formula and dipped into a nitrocellulose base white lacquer. These specimens together with strips of ultra-violet light-sensitive paper E were then placed into the exposure cabinet. Specimens of each were withdrawn at four-hour intervals starting at eight hours' exposure. Since the final lacquer stain was only slight for the standard polymer, there was very little change in this property from eight to 28 hours' exposure. In the case of the polymer containing the amine-type antioxidant, the stain was tan at eight hours and developed through progressive shades to a heavy brown at 28 hours. The discoloration of the standard polymer progressed from a yellow at eight hours to a light brown at 28 hours. The polymer containing the amine-type antioxidant discolored in a manner similar to the standard polymer except that in all cases the discoloration was slightly more intense. The ultra-violet light-sensitive paper E, which is dark blue in color prior to exposure, became progressively lighter in color during the 28 hours' exposure.

Since the discoloration of the standard polymer and the discoloration and the staining of the polymer containing the amine-type antioxidant were progressive through 28 hours, it appeared that almost any exposure time between eight and 28 hours could be used. It was believed, however, that a relatively long exposure time with the resulting more intense exposure effects would be more desirable. Therefore an exposure period of 24 hours, which would also be convenient for day to day testing, was selected.

Reproducibility and Lacquer Selection

In order to determine the reproducibility of testing in the exposure cabinet, white compounds of pale crepe, the standard GR-S polymer, and GR-S containing an amine-type antioxidant were prepared, and a sufficient number of specimens dipped into a white nitrocellulose-base lacquer to test each polymer daily for five consecutive days in both the exposure cabinet and the Fade-Ometer. Because of the very slight discoloration and staining with pale crepe, it was impossible to detect any variation in these properties. The stain of the standard GR-S polymer was found to be reproducible in both the exposure cabinet and the Fade-Ometer. Polymer discoloration was uniform in the exposure cabinet; however, slight differences were apparent in the specimens exposed in the Fade-Ometer. Slight variations in both staining and discoloration of the polymer containing the amine-type antioxidant were noted from day to day in both types of exposure equipment although the variations were somewhat less in the exposure cabinet than in the Fade-Ometer.

Since the nitrocellulose lacquer itself discolors slightly, such being characteristic of all nitrocellulose-base lacquers when exposed to ultra-violet light, it was believed desirable to investigate non-nitrocellulose lacquers: number 1 containing vinyl acetate, titanium dioxide and ethyl acetate; number 2 containing acrylic derivatives, titanium dioxide and toluene; and number 3 containing cellulose acetate propionate, Rezyl 36-5, xylene, titanium dioxide,

[1] United States Rubber Co., Synthetic Rubber Division, Naugatuck, Conn.

cellusolve acetate and ethyl acetate. These lacquers, prepared by the National Bureau of Standards, were compared with the white nitrocellulose-base lacquer previously used in this laboratory for stain testing. This latter lacquer was obtained from the Stanley Chemical Co., East Berlin, Conn., and was identified as number 61-G-426-1 (herein after referred to as lacquer number 61G) to be used with thinner 80-D-101.

The four lacquers were tested on clean metal strips as well as on a variety of GR-S polymers including both staining and non-staining types. Specimens of these polymers compounded in the white formula and dipped into each of the four lacquers were exposed in the Fade-Ometer and exposure cabinet. The results of these tests may best be presented by listing our observations as follows:

1. National Bureau of Standards (NBS) lacquers numbers 1, 2, and 3 show *no* staining (discoloration) on metal strips; while the 61-G lacquer shows very slight staining (discoloration). The staining referred to here is in reality a case of discoloration of the lacquer by the ultra-violet light as the metal used for the test did not contain stain producing components such as are common to certain elastomers utilized for the investigation.

2. With "non-staining" polymers, NBS lacquers numbers 1 and 2 exhibit only very slight staining; while NBS number 3 and 61-G lacquers are slightly stained.

3. With "staining" polymers, NBS lacquers numbers 1 and 2 are only slightly stained; while NBS number 3 and 61-G lacquers show very pronounced staining.

4. In general, NBS lacquer number 3 exhibits slightly more staining than the 61-G lacquer.

5. NBS lacquers numbers 1 and 2 are tacky and tend to stick to the metal parts of the exposure cabinet and Fade-Ometer, resulting in peeling of the lacquer film when the polymer strips are removed from the exposure equipment. This characteristic was not noticeable in the case of NBS number 3 and 61-G lacquers.

From the preceding observations it is concluded that NBS lacquers numbers 1 and 2 are unsatisfactory for stain testing. NBS lacquer number 3 compares very favorably to the 61-G lacquer. In general, the Fade-Ometer and exposure cabinet are equally effective for stain testing although the Fade-Ometer produced somewhat less staining than the exposure cabinet.

In connection with the evaluation of the NBS lacquers, the discoloration of the unlacquered portion of the polymer strips was also observed. The discoloration ranged from lemon-yellow for pale crepe to a dark brown for the polymer containing the amine-type antioxidant. In general, the discoloration caused by the Fade-Ometer was a darker shade of color than that caused by the exposure cabinet.

A number of strips of ultra-violet light-sensitive paper E were included with the polymer specimens for evaluation in both the exposure cabinet and the Fade-Ometer. It was found that the exposure of light-sensitive paper E in the Fade-Ometer for 24 hours corresponds to approximately 16 standard arc hours; while the exposure under the sun-lamps for 24 hours corresponds to approximately 10 standard arc hours. The number of standard arc hours was determined by comparing the exposed light-sensitive paper E with specimens of the same paper exposed at the National Bureau of Standards under standard conditions.

Compound Development

Previous experience in this laboratory with a compounding formula which contained five parts of zinc oxide, 15 parts of titanium dioxide, and five parts of magnesium oxide per 100 parts of polymer, where the present formula contains 10, 10, and 0 parts, respectively, showed that the previous formula tends to mask discoloration, whereas the present formula is more sensitive to discoloration. This point may be illustrated by the following table:

	Discoloration Observed		
	Previous Cpd. Formula	Present Cpd. Formula	Present Cpd. Formula
Type Polymer	24-Hr. Exposure	8-Hr. Exposure	24-Hr. Exposure
Pale Crepe	lemon-yellow	no sample	lemon-yellow
Stand. GR-S Polymer	lemon-yellow	lemon-yellow	light brown

Thus it is shown that the inherent discoloration of the standard GR-S polymer is brought out when the present compounding formula is used, and that the GR-S is inferior to pale crepe; when the previous formula was used, however, the two polymers showed similar discoloration. The use of different compounding formulae had no apparent effect on the staining of either pale crepe or the standard GR-S polymer. The present compounding formula yields a white cured specimen in which any pigmenting tendency is shown as a dark (usually gray) color on the unlacquered, unexposed portion of the specimen.

For the routine testing of polymer for pigmentation, discoloration, and staining in this laboratory a standard GR-S polymer sample is included for comparison purposes. This standard polymer, which is unstabilized regular GR-S derived from sodium sulfide shortstopped latex, shows no pigmentation on the unlacquered, unexposed area, a light-brown discoloration on the unlacquered, exposed area, and a very faint stain on the lacquered, exposed area of the specimen. Since the standard exhibits the best pigmenting, discoloring, and staining characteristics that could be expected of any GR-S polymer, it is used as a standard for comparison with other polymer samples.

At the present time GR-S polymers are graded relative to pigmentation, discoloration, and staining as *good*, *fair*, or *poor* on the individual properties; *good* is applied when the polymer appears equivalent to the standard; *fair* when only slight differences can be detected between the polymer and the standard; and *poor* when the polymer is significantly darker than the standard. Until such time that permanent color standards representing the degrees of pigmentation, discoloration, and staining are established by a National Testing Society, it will not be possible adequately and uniformly to describe these properties. In the meantime, however, each laboratory can determine the amount of pigmentation, discoloration, and staining which can be tolerated in the polymers in the uses for which they are intended.

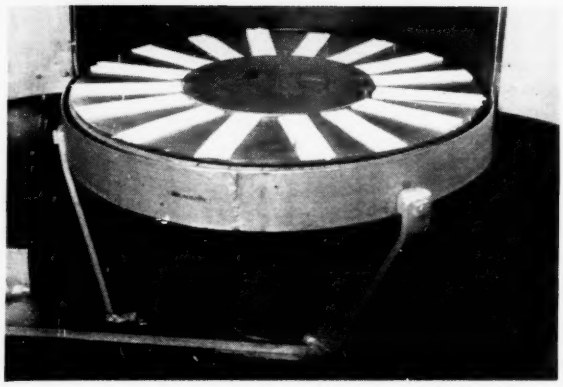
On the basis of observations given heretofore in this paper it is concluded that (1) a reliable procedure has been developed for determining the pigmenting, discoloring, and staining properties of GR-S polymers and (2) an exposure cabinet has been designed which can be constructed at low cost and maintained and operated with a minimum expenditure of time and money. The complete details of the testing procedure are as follows.

Scope of New Exposure Test

This method is intended for use to determine the pigmenting, discoloring, and staining characteristics of GR-S polymers and related materials. It may be used as a means for grading polymers for these properties, or as a test to determine the effect of special ingredients on pigmentation, discoloration and staining.

Principle of Method

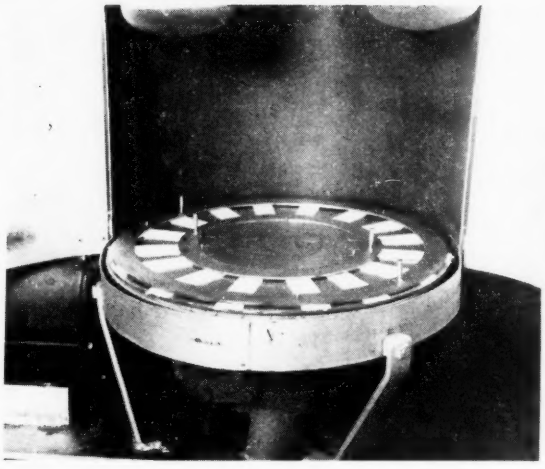
Specimens of polymer, compounded in a white formula and dipped for one half their length into a special



(Below)
Fig. 2. View of Exposure Cabinet Turn Table with Test Specimens and Masking Rings in Position

Fig. 3. Full View of Expcsure Cabinet with Doors in Partially Open Position

(Above)
Fig. 1. View of Exposure Cabinet Turn Table Showing the Positioning of Test Specimens Prior to Covering with Masking Rings



white lacquer, are exposed to the ultra-violet light from RS sun-lamps. Portions of the polymer strip are shielded from the ultra-violet light to provide four surfaces for comparison: (1) an unexposed and unlacquered area, (2) exposed, but unlacquered area, (3) exposed and lacquered area, and (4) an unexposed, but lacquered area. Comparisons are then made with a standard polymer tested in the same manner.

The degree of pigmentation may be determined by observing the unexposed and unlacquered portion of the polymer strip. Discoloration of the polymer is observed on the exposed, but unlacquered portion. Staining is noted on the exposed and lacquered area. Where the degree of staining is very slight, it is convenient to compare the exposed and the unexposed lacquered surfaces.

Safety Precautions

Because of the danger of injury to the analysts' eyes by the ultraviolet light, the doors of the exposure cabinet must be kept closed while testing is in progress. When it is necessary to handle the polymer samples in the cabinet, the lights should be turned off, or if this is not convenient, ultraviolet absorbing glasses must be worn by the analysts.

Equipment Used

Exposure Cabinet

A 1750-r.p.m. horizontal electric motor of approximately 1/20 h.p. is connected directly to a vertical drive speed reducer where the speed is decreased to approximately one r.p.m. A circular stainless steel plate, 16 inches in diameter, connected to the gear reducer serves as a revolving table for the polymer specimens. (See Figure 1.) Two flat stainless steel rings, each one inch wide, one having an outside diameter of 16 inches, and the other an outside diameter of 10 inches, are held in place on the revolving table by means of steel pegs. (See Figure 2.) The polymer specimens, one-inch by four inches in size with lacquer covering two inches of their length, are placed around the edge of the circular table with the ends pointing toward the center. With the two rings in place over the specimens, there are four one-inch surfaces for testing; one unlacquered and unexposed to ultra-violet light, one unlacquered, but exposed, one lacquered and exposed, and the fourth lacquered, but not exposed.

In order to protect the specimens from contamination and to protect laboratory personnel from ultra-violet light, the revolving table is surrounded by a sheet-iron cover 17 inches in diameter, as shown in Figure 3. The cover extends one inch below and three feet above the revolving plate and is closed at the top. It should be noted that the height of the cover above the plate is optional; a height of three feet was selected to permit wide variations in lamp height. Hinged doors, occupying one-half the circumference of the cover, permit easy access to the interior of the cabinet. Two General Electric 275-watt RS sun-lamps are mounted on a horizontal bar in such a position that the lamps are directly above the exposed strips, but diametrically opposite each other. The horizontal bar is connected to a vertical pipe which extends through the top of the cabinet and is adjusted to 20 $\pm$ 0.5 centimeters above the plate by moving up or down and is locked in position by three screw clamps. A three-inch stove pipe connected from the top of the cabinet to an exhaust fan provides an upward flow of

air for cooling purposes. With the lamps at a height of 20 centimeters, a temperature of approximately 115° F. is maintained at the surface of the plate.

Drying Rack

The freshly lacquered polymer strips are conveniently dried by attaching them to ordinary spring-type clothes pins which are fastened to horizontal wooden bars. Metal pans should be provided to catch the excess lacquer which drips from the specimens.

Materials

Compounding Ingredients

Sulfur—R.R. Standard
Zinc Oxide—N.B.S. Standard
Titanium Dioxide
Benzothiazyl disulfide—N.B.S. Standard

Standard Lacquer

A standard lacquer having the following approximate composition may be obtained from the Office of Rubber Reserve:

Lacquer	%
Cellulose acetate butyrate	10
Rezyl 36-5	3
Xylene	2
Titanium dioxide	3
Cellosolve acetate	25
Ethyl acetate	57
Total	100
Thinner	
Cellosolve acetate	30
Ethyl acetate	70
Total	100

Adjust the lacquer with thinner to a consistency which will yield a continuous, adherent thin film on the polymer specimen.

Standard Polymer

A supply of standard polymer may be obtained from the Office of Rubber Reserve. This material is unstabilized regular GR-S derived from sodium sulfide short-stopped latex.

Ultra-Violet Light-Sensitive Paper E

This paper may be obtained from the National Bureau of Standards. It is used as an exposure standard. Booklets of this paper exposed under standard conditions for a range of standard arc-hours may also be obtained from the Bureau of Standards.

Procedure for Test

Compounding

	Parts	Grams
Polymer	100.00	200.0
Sulfur	2.00	4.0
Zinc oxide	10.00	20.0
Titanium dioxide	10.00	20.0
Benzothiazyl disulfide	1.75	3.5
Total	123.75	247.5

Make certain that the laboratory mill is clean and free of carbon black or other compounding ingredients. Pass the polymer through the mill rolls twice, without banding, at a mill setting of 0.008- ± 0.002-inch (mill roll temperature 120 ± 10° F.); then band on the front roll using a mill setting of 0.025- ± 0.005-inch. As soon as the polymer bands completely, mill for a period of two minutes, making one ¾-cut from each side. Add the compounding ingredients as rapidly as possible in the order listed, making one ¾-cut from each side after completion of each addition. The mill should be opened gradually during the addition of compounding ingredients so as to maintain a rolling bank between mill rolls at all times. After all ingredients have been added make two ¾-cuts from each side; then pass the rolled stock endwise through the mill four times. Band the stock and sheet out at a mill opening to yield a strip of polymer 0.080- to 0.100-inch thick. The mill setting will vary with the type of polymer. The standard polymer should be compounded first. If it appears pigmented in any way, a second compound must be prepared before proceeding with other compounds.

Cure all stocks in a standard curing mold between aluminum foil having a thickness of 0.006-inch for a period of 50 minutes, using a press temperature of 292° F.

Lacquering

Die out two one- by four-inch specimens from the cured stocks of the polymer being tested as well as the standard polymer. The stock should be clean and free of oil film before dipping into the lacquer. The standard lacquer obtained from the Office of Rubber Reserve should be adjusted to a consistency which will yield a continuous, adherent, thin film by the addition of thinner. Dip the specimens into the lacquer to a depth of two inches and hang them on the rack to dry. Do not allow excess lacquer on the specimens to drain back into the dipping vessel since contamination of the lacquer may result. The lacquer will air-dry, as evidenced by the lack of tack, in approximately one-half hour.

Exposure

Place the lacquered specimens on the circular plate of the exposure cabinet with the ends pointing toward the center. Also place two strips of the Bureau of Standards ultra-violet light-sensitive paper E on the plate. Set the two rings in place over the specimens. Adjust the height of the lamps to 20 centimeters above the plate. Turn on the lamps and start the motor. When the lamps are operating properly, close the doors of the cabinet and allow the exposure to continue for 10 standard arc-hours. The length of the exposure period is determined by comparing the color of the ultra-violet light-sensitive paper E with the standard paper which has been exposed for 10 standard arc-hours. Under the operating conditions specified, 10 standard arc-hours are approximately equivalent to 24 hours' exposure. The exposure period, however, will vary with the efficiency of the lamps. Before placing a new lamp into service, it should be burned for at least 24 hours to bring out the full output of ultra-violet light.

Grading of the Polymer

Mount the exposed specimens on white cardboard with the standard polymer on the left to facilitate comparison. The specimens are then graded as follows:

Pigmentation. This property may be defined as the presence of color, usually gray, in a cured stock which has been prepared according to the specified compounding procedure. When the unexposed and unlacquered area of the specimen is equivalent to the standard in whiteness, the specimen is graded *good*; if only slight differences can be detected between the polymer and the standard, the polymer is rated *fair*; and if the polymer is significantly darker than the standard, it is rated *poor*.

Discoloration. This property may be defined as the color developed in a polymer compound according to

(*Continued on page 260*)

Deformation Characteristics of Rubber and Rubber-Like Compounds—As a Measure of Quality—Especially in Control[1]

L. V. Cooper[2]

THE first physical property that the early rubber technologists associated with the vulcanization of rubber mixes was the tendency to stiffen and become harder. Therefore the first control instrument or test device logically was the surface hardness indicator. It is only reasonable to expect that these technicians first used those instruments they were endowed with by nature—their teeth and fingernails.

Hardness

The first accepted portable commercial instrument that was brought on to the market was the Shore hardness tester which later was to be designated "Type A" durometer (D in Figure 1.) For years this instrument was an empirical standard of the industry, and because it was small enough to be carried in a vest pocket any substitute or replacement instrument was required to be as portable. As control became more possible and necessary, the unreliability of this instrument began to be extremely noticeable. As everyone knows, even new instruments which were received as a group did not necessarily agree among themselves or with previously purchased instruments and the rubber industry finally began to look upon the Shore durometer as an instrument for preliminary evaluation work rather than as an instrument useful as a standard.

Another instrument designed many years ago is the Pusey and Jones plastometer (P in Figure 2), and it definitely has made a place for itself. This plastometer is adjusted on the specimen, the indicator shaft lowered until contact is made and then lowered still farther until the gage needle makes three revolutions; then the weight of 1,000 grams is allowed to press on the indicator shaft, and the indentation caused in one minute by this load is noted (ASTM Test Method D-531-41). This instrument is readily adapted to making hardness determinations on curved surfaces, but it is too large to be easily portable. It is used as a standard, however, in many sections of the rubber industry for hardness determinations. Rubber covered rolls for the paper and the printing industries, particularly, are now bought under specifications calling for definite Pusey & Jones indentation or hardness figures.

About 1922 in our own company an instrument was designed (F in Figure 1), now known as the Firestone penetrometer. It is not generally accepted by other companies because it is more than twice as large as a Shore durometer and reads in reverse scale to the durometer. It measures penetration; therefore the harder the stock the smaller the hardness figure.

When dealing with technical people outside of our company, we necessarily had to use the durometer, and for years we had correction figures that we applied to our standard with respect to instruments of the same type in other organizations. When Motor Car Company "A" asked us to submit a slab with a durometer hardness of 50, we had to make a slab that gave a hardness reading of 55 on the durometer at Firestone; but were we to submit the same slab to Motor Car Company "B", they would tell us that the hardness was 57.

As early as 1925 the American Society for Testing Materials endeavored to agree on some hardness tester which would not have the failings of the Shore durometer. In 1929 a standard method of test for hardness of rubber was tentatively agreed upon, but the instrument had to be actuated by a dead weight since spring loading is not acceptable on a standard, and no matter how well engineered, it was necessarily clumsy and only semi-portable. However the need of this instrument was so great that by 1939 the standard machine was finally written into the specified methods of testing (D-314-39), and since then we have had our standard instrument (S in Figure 2). But because of its size (27 pounds

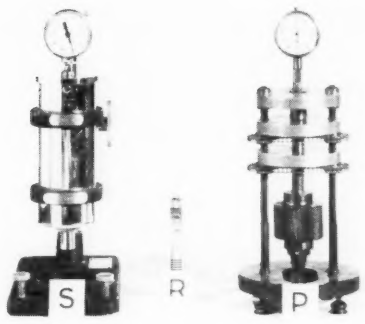


Fig. 2. Two Laboratory Hardness Testers Compared with Rex Gage; S Is ASTM Standard Instrument, and P is the Pusey & Jones Plastometer

Fig. 3. The Firestone Mill Room Control Modulus Tester

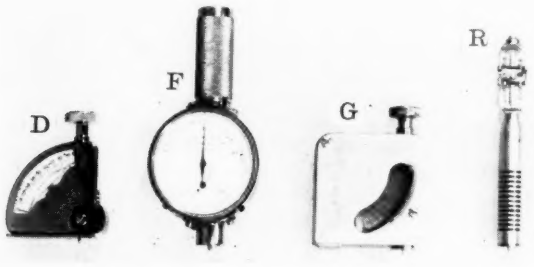


Fig. 1. Portable Instruments for Measuring Hardness: D, Type A Shore Durometer; F, Firestone Penetrometer; G, German-Made Hardness Tester; and R, the Rex Gage

[1] Presented before the Rubber Division, Chemical Institute of Canada, Montreal, P. Q., June 9, 1948.
[2] Firestone Tire & Rubber Co., Akron, O.

including case) and the fact that the reading is taken after 30 seconds it is principally for calibration and referee purposes and seldom for control testing. In this connection it might also be mentioned that ASTM hardness number is opposite to durometer figures giving a reading of 0 on glass as it also gives a direct measure of penetration.

The lightness and the small size of the durometer continued to make it the instrument generally used in spite of the fact that no one really trusted it. In an ASTM meeting in June, 1940, Lewis Larrick read a paper in which he explained the method by which he had been able to bring into agreement 70 durometers in use at the company with which he was then affiliated. However the durometer had fallen into such ill repute that it was some time before many people would even try to use Larrick's suggestions, but the impetus of the standardization desired during the last world war made it imperative that something be done about the durometer. Slowly various other companies, both large and small, began to investigate their own durometers and endeavor to recalibrate them according to Larrick's suggestions, and by 1944 a tentative calibration curve and method of calibrating were written into ASTM test methods (D-676-47T). This method is still in the tentative stage, but some order has been established in the former unreliable realm of Shore durometer hardness figures, and there is no reason now why Shore durometers should not give reasonably accurate hardness figures.

One of the most objectionable features to the Shore instrument is that when the case is opened, one of the main pivot bearings is removed, and it was felt a better mechanical design could be evolved. That such a possibility existed was proved by the fact that late in the recent war one of the technical teams brought back from Germany a hardness tester similar to the Shore durometer, but which is much better from an engineering standpoint (G in Figure 1). This German-made instrument is not much larger than a Type "A" Shore and is not any heavier as the case is aluminum. The front of the case is removable without disturbing any working parts, and permanent adjustments can be easily made. Also, the zero position of the indicator arm on the dial is at the top; therefore the weight of the arm keeps the gear mechanism in close mesh without the use of a spring. It is unfortunate that this instrument is not at present commercially available.

Meanwhile during the war the Hardness Testing Committee of D-11 succeeded in getting several American companies to make hardness testers of different designs. At least seven different hardness testers were made experimentally, and one of these has emerged as possibly the portable hardness tester of the future. This instrument is the Rex gage.

The Rex gage (R in Figures 1 and 2), although very different from the Shore durometer in design and appearance, can be calibrated in a manner similar to that used for the durometer, and as the indentor point is quite similar, comparable readings are obtained. The Rex gage is not easy to read as it involves a vernier scale observation, but the gage does not return to zero when the pressure is released, and therefore it is possible to take as much time as necessary to make the proper visual estimation. This instrument has been adopted by many people as their portable instrument, but the rapid or accurate reading of a vernier scale is not within the accomplishments of some people, particularly production line operators. The compact size and ruggedness of the Rex gage are highly desirable, however, and time will tell if it will be generally accepted.

The author before passing to other control instruments wishes to warn against the use of hardness conversion charts. Any surface hardness tester evaluates modulus at low elongation if the reading is immediate and modulus at low elongation plus plastic flow under the foot and indentor pressure if the determination is made after a definite time interval of application.

To attempt a conversion chart between two instruments with different times of taking the readings, different shaped indentor points, and different loading conditions means charting several variables without controlling any one of them. A reasonably correct chart on averages for similar compounds may be evolved, but someone is always ready to apply it to exceptional materials and different test conditions, which practice only leads to greater confusion. Hardness figures on rubber and rubber-like materials are functional properties peculiar to the material and to the instrument with which they have been obtained. Different states of cure, in particular, may cause serious discrepancies.

As quality improved and the volume of production increased, the quality control of rubber mixes during processing became a definite must in the manufacture of rubber products. When this condition first was recognized, hardness tests on the finished products were installed by means of a durometer, penetrometer, or, in a few cases, some other instrument. However after a product has been vulcanized and does not come within specified hardness tolerances it is too late to make adjustments, and unusable defective product is on hand.

For this control during process our company first used a hardness test on buttons cured from samples of each mill room batch as early as 1925. The hardness test instrument used was our own penetrometer. This instrument was rugged and easily checked and calibrated but, although it was satisfactory within its limitations, a more sensitive control was needed.

Modulus

Two instruments are available on the market at present for checking rapidly and accurately modulus at a point much higher on the stress strain curve. The first instrument is the Firestone mill room control modulus tester which automatically records the modulus in pounds per square inch at a definite elongation of a ring shaped test piece. The second is the strain tester of the National Bureau of Standards which allows the operator to read the elongation of a test strip when it is subjected to a definite load for one minute.

The Firestone instrument, as shown in Figure 3, has been in constant use for five years and in its present form is a development from which most of the weak links and sources of chronic maintenance trouble have been eliminated. The machine has a compensated head somewhat similar to a regular Scott testing machine head and can be set to record automatically the per square inch stress at any desired elongation. It uses a ring test specimen approximately one inch in diameter, but only one elongation determination can be made on a single specimen. The lower movable jaw immediately resets itself after making a test, but the pendulum must be manually returned to its zero position. This precaution is used because, although the machine is supposed automatically to spark record on the chart, the desired modulus determination, the operator can be certain that the record has been made before he moves the pendulum from its maximum position. An operator can operate two of these machines simultaneously and easily make 50 determinations per hour on each machine. The center

disk from the inside of the ring modulus test sample can be used for solution gravity testing if desired. This machine makes a rather rapid modulus determination which does not evaluate plastic flow in certain stocks which we did encounter in the first stages of the development of so-called synthetic rubber. This evaluation is not a necessary one at present, and the machine is today a valuable control tool.

At the April, 1948, Chicago meeting of the Division of Rubber Chemistry, A. C. S., the strain tester[2] of the Bureau was discussed by Roth and Stiehler. The test strip used in this machine is a strip specimen ¼-inch wide and six inches long. Bench marks are spaced 10 centimeters apart, and after the strip has been placed in

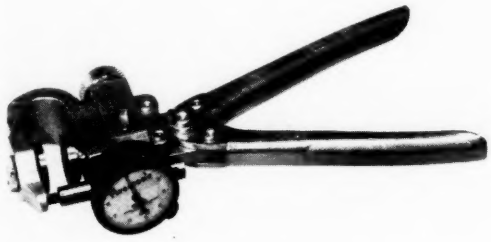


Fig. 4. The Firestone Modumeter

the machine a stress of 600 pounds per square inch based on the original cross-section is exerted, and the elongation between the bench marks is observed after a period of one minute. Making the observation after an elapsed time of one minute evaluates not only the modulus of the strip, but the plastic flow under that strain. The machine is so equipped that the reading must be taken in an elapsed time of eight seconds and is a precision reading.

Every rubber technologist knows that raw compounded stock which is perfect after it has been mixed in the mill room does not necessarily give a perfect finished product. Delays in processing which cause excessive working on the warm-up mill, improper blending at some time during the processing cycle, variations in curing conditions, and many other variables which are hard to control result in modulus variations in the stock which was well within the limits when first mixed.

Much has been written on rubber as an engineering material, but to use it as such one must know its characteristics. Unfortunately, to use usual laboratory evaluation one must necessarily destroy the product to get the test sample.

Compression Modulus

A method has been devised which checks reasonably well the properties of the individual part, as it is ready for delivery to the customer, without actually destroying or even flexing the part. The method consists of incorporating in the curing molds a cylindrical cavity approximately ½-inch deep and ½ square inch in area. The rubber product is built with an excess amount of rubber that will flow into this cavity as well as into the cavity of the product desired. As the part is cured, so is the little pellet, and any variations in the total cure of the large part will also affect the cure of the smaller part. After the mold has been opened, the small cylindrical block adheres to the larger part by means of a small thin overflow rind, and thus the part and its check samples are integral.

The rapid evaluation of this small cylindrical disk can be made by the modumeter[4] shown in Figure 4. This

[2] India Rubber World, June, 1948, p. 367; July, p. 513.
[4] *Experimental Stress Analysis*, July, 1947, p. 49.

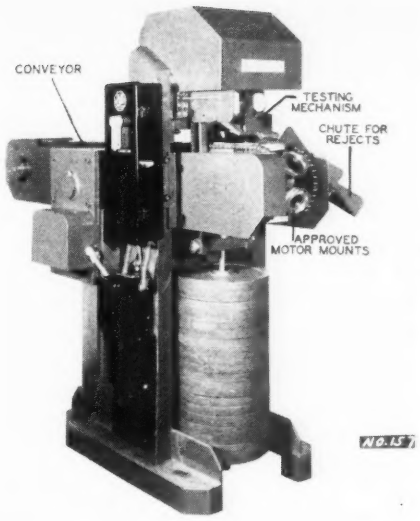


Fig. 5. Link-Reising Machine for Testing Automotive Mounts

instrument measures the force in pounds per square inch necessary to produce a compressive distortion of 20%. A compensator is built into the machine to allow for differences in shrinkage, and the reading is rapid and direct. This machine lends itself very well to evaluating decay under load or the tendency of a stock to flow under compression, thus giving a lower compression modulus figure after a time interval. Most rubber parts used in compression usually are subjected to a load for longer than an instantaneous loading, and this change in load carrying ability must be taken into consideration when the size and the shape of the rubber structure are being designed.

Another outstanding desirable feature of this method of testing is that tests are actually made on the rubber that is in the part, and also evaluation is made at a compressive deformation much closer to the operating deformation as compared to the low compressive deformation evaluated by a hardness tester or the higher extension elongation of the tension modulus tester.

Another machine which actually tests finished products using low deflection characteristics for a basis for acceptance or rejection is the Link-Riesing machine pictured in Figure 5. This machine is essentially an automatic operation which places a definite load on engine mountings as they pass under the superimposed load, and they are either accepted or rejected, depending upon the deflection caused by the superimposed load. Should an engine mount not give the proper deflection, it is automatically ejected from the belt and not allowed to pass on with the acceptable parts. This machine can be used to advantage on many types of load carrying rubber mountings either by the vendor or the customer.

We must have rubber products in many phases of our life today, but the more consistent these rubber products are the more we will enjoy the advantages they bring. We have devised many types of instruments and machines to assist us in controlling such products. We do have a reasonably satisfactory hardness tester; we do feel that our modulus control in production is economically satisfactory, and we do feel that we are evaluating the serviceability of our finished product, but we cannot stand still. The raw product that nature supplies will continue to be variable despite our best efforts. We have made much progress in ironing out the differences by modern plantation methods. The close control on the manmade raw materials has been

(*Continued on page 280*)

Safe Acceleration for Use with Fine Particle Size Reinforcing Furnace Blacks[1]

(2, 4 Dinitrophenyl Benzothiazyl Sulfide)

F. L. Holbrook[2] and B. A. Hunter[2]

THE newer fine furnace carbons, referred to as VFF, very fine furnace, or RF, reinforcing furnace, are reported as equal or superior to channel blacks in tire treads.[3] As these new blacks, reportedly, can be made with more efficient utilization of hydrocarbon than is realized in the channel process, it has been predicted that a gradual obsolescence of the latter will result.[4] This potential economy of manufacture plus excellent reinforcing action in both natural rubber and GR-S makes these new furnace blacks of increasing importance. There are, however, some problems connected with their use in natural rubber stocks and, more particularly, in natural rubber tread stocks.

Processing Problems

The rate of vulcanization of such stocks containing these new furnace blacks, with the conventional rubber accelerators, is much more rapid than when channel black is used for reinforcement. This is undoubtedly associated with the relatively high alkalinity of these furnace blacks as indicated by pH measurements.[5] This rapid rate of cure is reflected in lower accelerator requirements and a pronounced tendency for prevulcanization or scorch at normal processing temperatures.

The processing difficulties attending the use of excessive accelerator with these new blacks have previously been described, and, conversely, the danger from drastic accelerator reduction has been considered. Thus Cranor, Snyder, and Cobbe[5] have pointed out that excessive accelerator reduction as a means of overcoming scorch of very fine furnace black stocks may lead to a condition described as "accelerator starvation" characterized by "lethargy in modulus development, lack of rebound and low tensile."

Cranor and associates[5] also state that no problems are encountered in adjusting GR-S compounds containing fine furnace carbon for cure and processing. Likewise, with mixtures of very fine furnace and channel carbon in natural rubber, the curing proceeds in much the same manner as with straight channel black loading with no abnormal scorch problem.

In order to illustrate the inherent differences in curing and processing characteristics of the very fine furnace (VFF) and normal channel (MPC) blacks respectively, the two are compared in typical natural rubber tread type stocks. The recipes are given in Table 1.

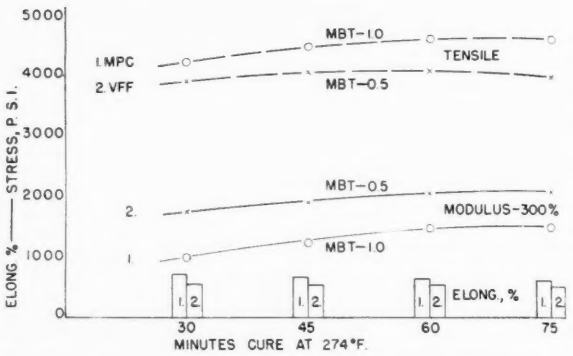


Fig. 1. Curing Characteristics of the Two Stocks in Table 1, *A*, MPC Black and One Part of MBT; *B*, VFF Black and 0.5-Part of MBT

TABLE 1. TEST RECIPES

	A	*B*
Smoked sheets	100	100
MPC black	45	
VFF black		50
Zinc oxide	5.0	5.0
Antioxidant	1.0	1.0
Disproportionated rosin		2.0
Zinc laurate	3.5	2.0
Pine tar	3.5	3.5
Sulfur	3.0	3.0
Accelerator	as shown below	

It will be noted that recipe *B* containing the VFF black differs somewhat in composition from *A* in that the fatty acid content is reduced and disproportionated rosin added to aid in controlling scorch[5]. At the same time the black content is raised from 45 to 50 parts because of abrasion consideration and based on suppliers' recommendations.[6]

For stock *A*, 1.0 part of mercaptobenzothiazole (MBT) is a normal amount of acceleration. For stock *B*, owing to the more rapid rate of cure brought about by the VFF black, the MBT must be reduced to 0.5-part to approximate the results obtained with the normally accelerated *A*.

In comparing the curing characteristics of the two stocks (Figure 1) recognition must be taken of the differences in physical properties which result from the use of VFF blacks. These are lower tensile and breaking elongations plus higher modulii with T-50 values indicating about the same rate of cure or sulfur combination. Torsional hysteresis values are generally lower. These together with T-50 results are shown in Table 2.

TABLE 2. 2 MERCAPTOBENZOTHIAZOLE WITH MPC AND VFF BLACKS RESPECTIVELY

Cures at 274° F. Min.	Recipe *A* (MPC Black) MBT—1.0	Recipe *B*, (VFF Black) MBT—0.5
	T-50 at 350°F.	
30	−0.4	−0.6
45	−5.8	−5.2
60	−12.1	−11.9
75	−17.1	−16.8
	Torsional Hysteresis	
30	0.184	0.201
45	0.179	0.090
60	0.171	0.093
75	0.165	0.087

[1] Presented before the Division of Rubber Chemistry, A. C. S., Chicago, Ill., Apr. 22, 1948.
[2] Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn.
[3] R. L. Carr and W. B. Wiegand, INDIA RUBBER WORLD, 116, 205 (1947).
[4] C. A. Stokes (abstract) *ibid.*, 116, 650 (1947).
[5] *Ibid.*, 117, 749 (1948).
[6] Private communication from D. F. Cranor, Binney & Smith Co., New York (Feb. 25, 1947).

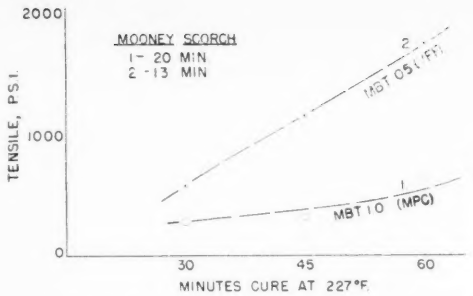


Fig. 2. Tensile Build up and Mooney Scorch Values for Stocks *A* and *B* of Table 1

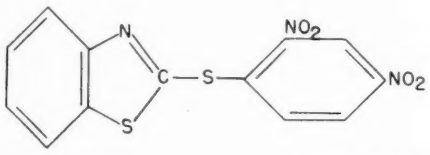


Fig. 3. 2,4 Dinitrophenyl Benzothiazyl Sulfide —DiNP-BTS

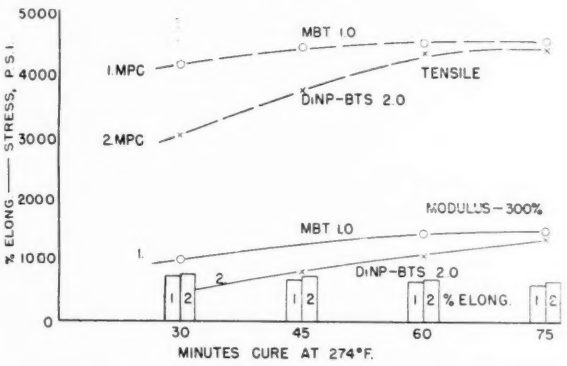


Fig. 4. Curing Characteristics of MPC Stocks with MBT *vs.* DiNP-BTS

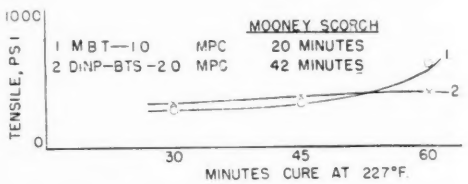


Fig. 5. Tensile Build up and Mooney Scorch Values for MPC Stocks with MBT *vs.* DiNP-BTS

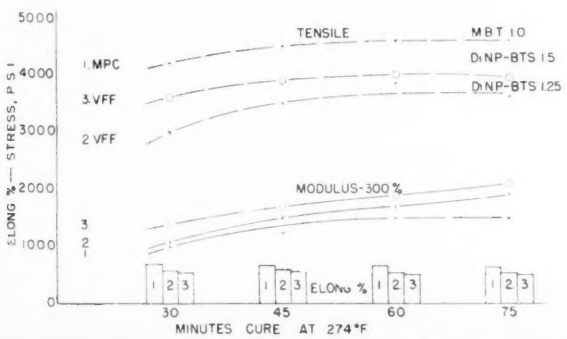


Fig. 6. Curing Characteristics of VFF Stocks with MBT *vs.* DiNP-BTS

Consideration of processing safety, as indicated by tensile values for cures made at the relatively low temperature of 227° F. (5 p.s.i. steam pressure), shows a much earlier and higher tensile build up with the VFF black. This greater heat sensitivity is confirmed by Mooney scorch values (Figure 2).

The need of safer acceleration than MBT with the VFF black is at once apparent. This point is particularly true in view of the present trend toward the use of natural rubber in tire treads.

Type of Acceleration Needed

In considering possible suitable acceleration for this application, a point of departure might be taken in the observation that certain accelerators have a decidedly retarded rate of cure in conventional natural rubber channel black stocks and may be classified as "slow." Such materials might conceivably be activated enough by the faster curing alkaline furnace blacks to give an acceptable rate and degree of cure and at the same time an adequate margin of processing safety.

Among the chemicals considered, 2,4 dinitrophenyl benzothiazyl sulfide appears to have the type of characteristics sought (Figure 3). Its chemical formula combines the mercaptobenzothiazole molecule with the acidic dinitrophenyl group. The latter lends retardation to the accelerating action, while the molecule as a whole retains much of the highly desirable characteristics of mercaptobenzothiazole itself.

Actually, 2,4 dinitrophenyl benzothiazyl sulfide is not a new material. It has been used quite widely in natural rubber, but owing to its slow rate of vulcanization, amine activation in the form of guanidine has been a requisite. The curing and scorch characteristics when used without an activator, are shown for an MPC black stock in Figures 4 and 5 and Table 3.

TABLE 3. 2 MERCAPTOBENZOTHIAZOLE *vs.* 2,4 DINITROPHENYL BENZOTHIAZYL SULFIDE WITH MPC BLACK—RECIPE *A*

Cures at 274° F. Min.	MBT 1.0 T-50 at 350°F.	D.N.P.-BTS 2.0 T-50 at 350°F.
30	− 0.4	+10.0
45	− 5.8	+ 3.0
60	−12.1	− 5.0
75	−17.0	−12.0
	Torsional Hysteresis	
30	0.184	0.241
45	0.179	0.264
60	0.171	0.252
75	0.165	0.231

Performance Characteristics of 2,4 Dinitrophenyl Benzothiazyl Sulfide

When 2,4 dinitrophenyl benzothiazyl sulfide is used with VFF black, the required activation is largely provided (Figure 6). Again when the tensile and modulus characteristics associated with VFF black are recognized, T-50 values indicate a normal rate of cure when 1.5 parts of the accelerator are present (Table 4).

TABLE 4. 2 MERCAPTOBENZOTHIAZOLE WITH MPC BLACK *vs.* 2,4 DINITROPHENYL BENZOTHIAZYL SULFIDE WIT VFF BLACK

Cures at 274° F. Min.	Recipe *A* (MPC Black) MBT 1.0	Recipe *B* (VFF Black) D.N.P.-BTS. 1.25	D.N.P.-BTS.-1.5
	T-50 at 350°F.		
30	− 0.4	− 7.6	− 1.9
45	− 5.8	− 2.3	− 5.1
60	−12.1	− 7.0	−12.1
75	−17.0	−13.8	−17.1
	Torsional Hysteresis		
30	0.184	0.155	0.136
45	0.179	0.110	0.110
60	0.171	0.103	0.090
75	0.165	0.096	0.088

Tensile build up at 227° F., and Mooney scorch values indicate excellent safety characteristics (Figure 7). A

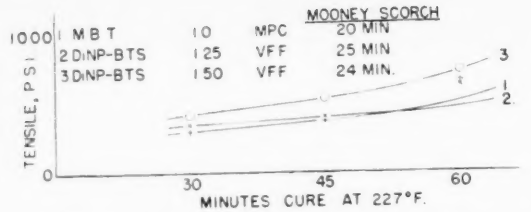


Fig. 7. Scorch Values for VFF Stocks with MBT *vs.* DiNP-BTS

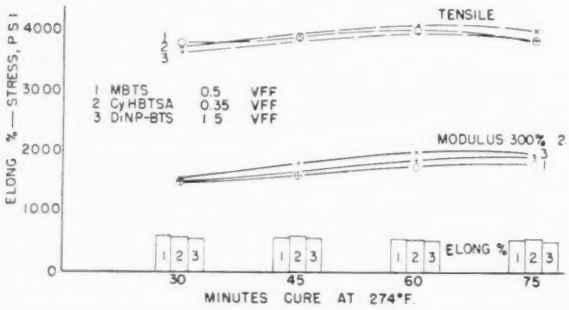


Fig. 8. Curing Characteristics for VFF Stocks with MBT *vs.* CyHBTSA and DiNP-BTS

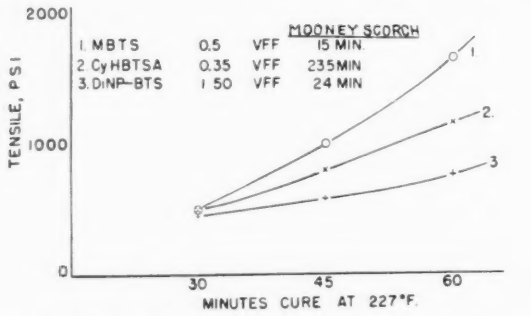


Fig. 9. Tensile Build up and Mooney Scorch Values for VFF Stocks with MBT *vs.* CyHBTSA and DiNP-BTS

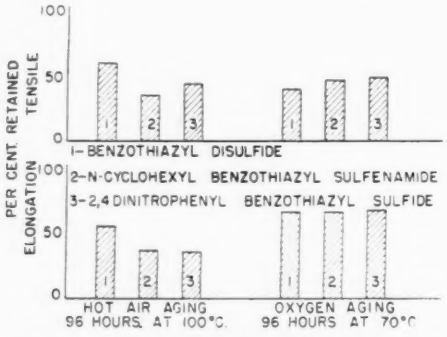


Fig. 10. % Tensile and Elongation Values Retained after Aging in Air at 100° C. and in Oxygen at 70° C. for VFF Stocks with BTS, CyHBTSA, and DiNP-BTS Accelerators

further advantage to be noted is the substantial amount of accelerator required which materially reduces sensitivity to small weighing variations in practice.

Compared to other common accelerators usually classified as having good safety characteristics, 2,4 dinitrophenyl benzothiazyl sulfide shows up to advantage with VFF black. Such other accelerators are benzothiazyl disulfide (MBTS) and N cyclohexyl benzothiazyl (abbreviated Cy Hex BTSA). For approximately equivalent amounts, the three accelerators give stocks having essentially the same tensile and modulus values (Figure 8).

T-50 values indicate that the amount of the N cyclohexyl benzothiazyl sulfenamide used (0.35-part) is slightly on the low side (Table 5).

TABLE 5. 2, 4 DINITROPHENYL BENZOTHIAZYL SULFIDE *vs.* OTHER DELAYED ACTION ACCELERATORS WITH VFF BLACK

Recipe *B*

Cures at 274° F. Min.	MBTS-0.5	Cy. Hex. BTSA-0.35	D.N.P. BTS-1.5
	T-50 at 350°,		
30	− 0.5	− 5.0	− 1.9
45	− 5.3	− 2.5	− 5.1
60	−11.1	− 8.0	−12.1
75	−16.3	−12.0	−12.1
	Torsional Hysteresis		
30	0.094	0.210	0.136
45	0.081	0.096	0.110
60	0.081	0.094	0.090
75	0.079	0.081	0.088

Tensile build up at 227° F. and Mooney scorch classify the MBTS as "scorchy," the N cyclohexyl benzothiazyl sulfenamide as intermediate, and the dinitrophenyl benzothiazyl sulfide as showing the greatest margin of safety (Figure 9). While the Mooney scorch figures show a lesser difference than the scorch tensile values, the latter do indicate a less rapid rate of set up for stocks containing 2,4 dinitrophenyl benzothiazyl sulfide.

Aging comparisons line up the respective stocks containing these three accelerators in the general order indicated by past experience. Thus in hot air at 100° C. the greater percentage of retained tensile is obtained with straight MBTS acceleration rather than with either of the benzothiazyl derivatives. At 70° C. in oxygen under 300 p.s.i. pressure all three accelerators give stocks of reasonably comparable aging properties. In general, the aging characteristics to be associated with stocks containing either 2,4 dinitrophenyl benzothiazyl sulfide or N cyclohexyl benzothiazyl sulfenamide are considered essentially equal (Figure 10).

Summary

The reported excellent reinforcing action and indicated economy of production of the fine furnace blacks makes them of increasing importance for use in tire treads. The much more rapid rate of vulcanization obtained when these new blacks are used, and particularly with natural rubber, presents the problem of pronounced processing scorch. The need of slower and less active accelerators than those commonly used is apparent. The data presented show that 2,4 dinitrophenyl benzothiazyl sulfide is a material having the type of accelerating characteristics needed.

Reports from Russia

A Stockholm newspaper, the *Aftonbladet*, reports that Russia is now successfully growing a new type of rubber-bearing plant in the Arctic region of Yamalonetz. The recently developed rubber plant, or rubber beet as it seems to be called, is said to be obtained by the crossing of *Kok-saghyz* with a plant from the Arctic regions.

News from Singapore indicates that Russian purchases of Malayan rubber continue and in August amounted to 16,000 tons, valued at nearly £1,500,000.

Recently Moscow Radio announced the merger of the chemical and rubber industries in a Chemical Industry Ministry under M. G. Chermuchin. It was explained that the step had been taken to attain "more thorough utilization and further development of the production powers of the undertakings and to safeguard the complex expansion of the chemical industry."

EDITORIALS

Election Results Unlikely to Affect Business Very Much

THE results of the national elections, although somewhat unexpected, are likely to provide confirmation for the belief that has been developing in this country recently that in view of the present state of the world, business conditions in general are not going to be affected very much, no matter which party is in control of the government. The influences at work are international in scope rather than domestic, and the next administration, whether new or old, will be forced to deal with these circumstances.

Foremost among the reasons for the belief that business conditions will remain substantially the same is the foreign policy of the United States, which is supported by both major political parties and 90% of the people of the country. With no signs of a break in the international situation, a strong armament program is being added to the non-military European Recovery Program, which latter program is already supplying a significant amount of impetus to the current high industrial production rate.

Under such conditions government participation in business may become greater rather than less. The Democratic administration has been criticized for too great interference with private industry; however, the Republican presidential candidate had been quoted in this connection as follows:

"Whether we like it or not, and regardless of the party in power, government is committed to some degree of economic direction. Certain government measures to influence broad economic conditions are both desirable and inevitable."

An attempt to make the operations of the executive branch of the government more efficient by eliminating duplication of effort and having the right men in the right jobs is on the agenda for whomever was elected president. Former President Herbert E. Hoover heads a non-political committee which will soon be making far-reaching recommendations on this subject.

With the Democratic party in control of both the executive and legislative branches of the government the policy and existing laws on certain matters of rather special interest to business may be altered where major changes were not desired, and in other cases when a different or clearer policy would have been helpful, action may be slow or never materialize.

One case in point is the Taft-Hartley Act, which may be repealed or drastically revised despite the fact that the record of management-labor relations in industry has been better since this Act was passed than it was for some time previous.

The Sherman-Clayton Anti-Trust Acts are in need of revision or least clarification so that business will not be subjected to so much uncertainty in the interpretation of these laws as is the case at the present time. With a Democratic administration any improvement in this situation is likely to be slow in making its appearance.

Both major parties were in favor of a strong farm policy, and no great changes were expected in this field, although a more realistic price support program would be advantageous to the country as a whole.

The writer in Lockwood's *Rubber Report* for October under the heading of "The Business Climate" summarizes present and probable future business conditions in a manner which is particularly pertinent at present when he states:

"Business generally is paying more attention to restricting inventories and commitments, but high prices make the dollar values mount to higher levels.

"Increasing costs and efforts to keep selling prices as low as possible have caused the break-even point to edge higher. An increasing strain is placed on working capital. All factors combine to make necessary more attention to costs and operating efficiency. Pressure mounts on both business and the consumer as more money is spent for armament and world rehabilitation in efforts to stop the spread of Communism.

"These expenditures are bound to be reflected eventually in continued high taxes. Government expenditures will continue to run into huge sums. Opportunities for even an efficient administration to reduce federal expenditures are practically non-existent. Major federal expenditures lie in sustaining a huge military establishment, requirements for veterans, interest on the public debt, and world relief."

Why Not CHEMICAL Instead of *Synthetic* Rubber?

SINCE 1942 when "synthetic" rubber became such an important raw material for the world's rubber goods manufacturing companies, there has been dissatisfaction with the word *synthetic*, as denoting an inferior and substitute material. Recent events indicate that such rubber may soon earn the right to be identified by a term less objectionable than *synthetic*.

It is not to be forgotten that by chemical synthesis many products superior to or in addition to those produced by nature for the improvement of the health and well-being of man have been made. For general use, however, the term *synthetic* leaves much to be desired.

The term **chemical** rubber has been used with increasing frequency of late, and one of the strong supporters of the use of this terminology is Everett G. Holt of the United States Department of Commerce, well known for his years of service to the rubber industry. It is suggested that the major consuming companies, their trade association, and the government agency combine in a campaign to encourage the use of the term **chemical** instead of *synthetic* rubber.

DEPARTMENT OF
PLASTICS TECHNOLOGY

Plasticizers in the Plastics Industry[1]

LaVerne E. Cheyney[2]

THE origin of the modern plastics industry is generally credited to the discovery of celluloid, that is, cellulose nitrate plasticized with camphor, by John Wesley Hyatt in 1869. Camphor was not the first material used to soften cellulose nitrate; materials such as castor oil had been employed previously. Other materials had also been softened by the addition of secondary ingredients as far back as the softening of mud with water in the fabrication of thatched huts, which represents probably the first application of a true plastic material.

The combination of cellulose nitrate and camphor is especially interesting because, although many other combinations of materials have been studied, this composition has still not been replaced, and cellulose nitrate plasticized with camphor is still a very important product in the general plastics market. Many other plasticizers are now employed not only with cellulose nitrate, but with other cellulose derivatives vinyl polymers, synthetic rubbers, and other polymeric materials. The total volume of plasticizers now employed is large and is still increasing rapidly.

Attention should be directed at this point to the reciprocal nature of the polymer-plasticizer system. Without cellulose nitrate there obviously could have been no celluloid, but just as certainly there could have been none without the camphor. The final composition contains both, and each is essential to the character and performance of the finished product. A similar situation exists in all cases where plasticizers and polymers are involved. Although not all applications of polymer require plasticizer, all uses of plasticizer as such require that polymer be present.

Characteristics of Plasticizers

We have discussed thus far the subject of plasticizers without defining the subject itself. Plasticizers may be defined as materials which are added to polymer compositions in order to make them more plastic. This effect may be temporary or it may be permanent.

Specifically, plasticizers are used in plastic compositions for a variety of reasons. In the case of cellulose acetate molding powder, for example, plasticizers are employed primarily to lower the softening temperature. Plasticizers are added to some thermosetting molding compositions to improve flow during molding. The high flexible vinyl compositions contain plasticizers which are responsible for the high degree of flexibility. Some of these vinyl compositions, particularly the very thin sheeting sometimes identified as plastic film, contain plasticizers which impart superior flexibility at low temperatures. Vinyl wire insulation may contain flame-resistant plasticizers. Other types of plasticizers employed with wire insulation may actually impart superior insulating characteristics. Still other plasticizers may be employed for imparting oil or grease resistance or other special characteristics to the particular composition in question.

As far as specific types of applications are concerned, these may be subdivided for the purpose of this discussion into two general classes: those which the fabricator formulates; and those which the fabricator does not formulate. In the former category are found such applications as the manufacture of plastic tubing, plastic films, and others. Those in the latter category include such items as molding powder, at least some types of surface coating compositions, and plastic sheets employed for end-use fabrication. The users of such items as molding powders are often relatively uninformed concerning the possible variations in composition and performance which may be the result of variations in plasticizer type and concentration. Those who formulate their own products are more likely to realize the significance of such variations, although even among this group there is a tendency to consider all plasticizers as equivalent to one another and to compare them only on a price basis. This, of course, represents the extreme condition and is not true of all fabricators.

Effects of Plasticizers

It is worth examining at this point some typical effects produced by varying plasticizers in plastic products, together with some indication of the variation in properties resulting from changes in plasticizer type or concentration.

Probably the oldest use of plasticizers was to improve processing of the plastic mix, usually by lowering the softening temperature or by improving fluidity or flow at a given temperature. An example of this is the effect produced on cellulose acetate, a typical cellulose derivative, by certain plasticizers as shown in Tables 1 and 2.

TABLE 1. COMPARISON OF FLOW PROPERTIES OF CELLULOSE ACETATE CONTAINING STANDARD AMOUNTS OF VARIOUS PLASTICIZERS*

(All compositions contained 100 parts Type FM-6 cellulose acetate and 40 parts plasticizer.)

Plasticizer	% Flow†
Diethyl phthalate	0.17
n-Isopropyl benzene sulfonamide	0.58
n-Isopropyl toluene sulfonamide	0.41

*Data from Bergen and Craver, *Ind. Eng. Chem.*, 39, 1082 (1947).
†Determined by A.S.T.M. D569-44T (two minutes at 275° F. and 1,500 p.s.i.).

Another common effect is that on the stress-strain characteristics of the plastic. This effect is illustrated in Figure 1, which shows typical effects on stress-strain curves of certain ethyl cellulose plastics created by varying quantities of plasticizers. Effects such as these are often the results of the use of plasticizers rather than the reasons for such use, although this point is not true in the case of the highly flexible vinyl compositions. The stress-strain curve is quite useful as an index of flexibility or pliability, brittleness, and toughness. A curve close to the load axis (high modulus of elasticity) is indicative of a stiff material; when this is combined with low tensile strength, the material is brittle. Flexible materials, on the other hand, have a low modulus of elasticity; that is, they are readily distorted by a small load.

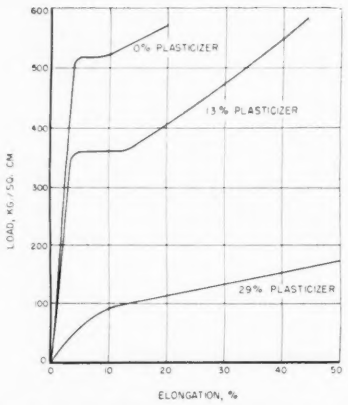


Fig. 1. Effect of Variation of Plasticizer (Castor Oil) Content on Stress-Strain Properties of Ethyl Cellulose Plastics[3]

TABLE 2. COMPARISON OF HARDNESS OF MOLDED CELLULOSE ACETATE COMPOSITIONS HAVING SAME FLOW TEMPERATURE*

(All compositions contained sufficient plasticizer to produce a 266° F. flow temperature. Cellulose acetate of 38.5% acetyl content was employed.)

Plasticizer	Parts by Weight	Rockwell "M" Hardness
Dimethyl phthalate	37.8	79.5
Diethyl phthalate	59.5	49.0
Dimethoxyethyl phthalate	62.5	20.6
Dibutyl phthalate	21.0	57.6
Diamyl phthalate	21.5	56.5
Triphenyl phosphate	22.5	72.0
Tricresyl phosphate	27.4	48.9
Dibutoxyethyl phthalate	22.6	54.6
Dibutyl sebacate	23.6	23.6

*Data from Fordyce and Meyer, *Ind. Eng. Chem.*, 32, 1057 (1940).

The effect on hardness is usually somewhat easier to measure. It is actually related to the stress-strain characteristics, especially those in compression. In fact, some investigators evaluate hardness in terms of the yield point, which is represented by the point of inflection in the curves shown in Figure 1. Hardness is a property of great practical importance since it determines the so-called "print resistance" of lacquers and other coatings. The addition of a larger quantity of plasticizer usually results in additional softening of the composition, at least within the limits of compatibility. It is possible to avoid this oversoftening or decrease in hardness, especially at room or use temperatures, by employing certain types of plasticizers which have effective plasti-

[1] Presented before annual conference, Society of Plastics Engineers, Inc., Detroit, Mich., Jan. 23, 1948.
[2] Battelle Memorial Institute, Columbus, O.
[3] Data from "Ethocel Handbook," Dow Chemical Co., Midland, Mich. (1940).

cizing action only at elevated or processing temperatures.

The point is exemplified by dimethyl phthalate, a plasticizer widely employed with cellulose acetate. The data of Table 2 illustrate the fact that dimethyl phthalate in an amount which produces a standard softening point also produces a harder finished composition than comparable concentrations of other plasticizers. This illustrates the possibilities which lie in compounding in this particular general field.

Low-temperature characteristics are important for many applications, especially with the plasticized vinyls. Stiffening or brittle temperature is therefore an important criterion of plasticizing action. Table 3 illustrates the wide variation in stiffness temperature which is obtained with a series of vinyl compositions plasticized to the same room temperature flexibility with different commercial plasticizers having different degrees of room temperature efficiency.

TABLE 3. COMPARISON OF STIFFNESS TEMPERATURES OF VINYLITE VYNW COMPOSITIONS CONTAINING VARIOUS PLASTICIZERS*

(Compositions contain adjusted quantities of plasticizer to give same flexibility at room temperature).

Plasticizer	Chemical Composition	Stiffness Temperature, °F.
Kronitex, Lindol	Tricresyl phosphate ...	0
Flexol TOF	Tri-(2-ethylhexyl) phosphate	-50
Flexol DOP	Di-(2-ethylhexyl) phosphate	-16
Kronisol	Dibutoxyethyl phthalate	-15
Monoplex DBS	Dibutyl sebacate	-31
Santicizer B-16	Butyl phthalyl butyl glycollate	-5
Flexol 3GO	Triethylene glycol di-(2-ethyl-hexanoate)	-34.5

*Data from Doolittle, *J. Polymer Sci.*, 2, 128 (1947).

Many plastic compositions are used for electrical insulation, and here again the choice of plasticizer is important in determining the results obtained. Results reported for plasticized polyvinyl chloride compositions by Fuoss are shown in Figure 2. Electrical insulation also represents one of the numerous cases in the plastics field where flameproofness or at least flame resistance is highly important. Tricresyl phosphate has been widely employed because it is a relatively flame-resistant plasticizer. Some chlorinated compounds are also good flame-resistant materials which are frequently selected for use where this property is of importance.

Oil resistance is important in some applications, especially in gaskets and seals and in the packaging field. Here a plasticizer such as dimethoxyethyl phthalate is of outstanding value. Plasticizers such as triacetin are useful also in such instances, but are valueless when resistance to water is also required.

When the utmost resistance to water is required, an interesting comparison is afforded between two close relatives in the phthalate series, dioctyl phthalate and dibutoxyethyl phthalate, which possess apparent similarity in chemical structure and have very analogous plasticizing efficiencies in vinyl chloride polymers and copolymers. Plasticized compositions containing dibutoxyethyl phthalate are definitely more sensitive to water, however, than similar ones containing dioctyl phthalate. This difference illustrates very graphically the secondary hazards which may be encountered when plasticizers are substituted for one another without a thorough

[4] Data from Fuoss, *J. Am. Chem. Soc.*, 61, 2334 (1939).

[5] M. M. Safford, to General Electric Co. (Jan. 13, 1942).

[6] *J. Soc. Chem. Ind.*, 52, 251T (1933).

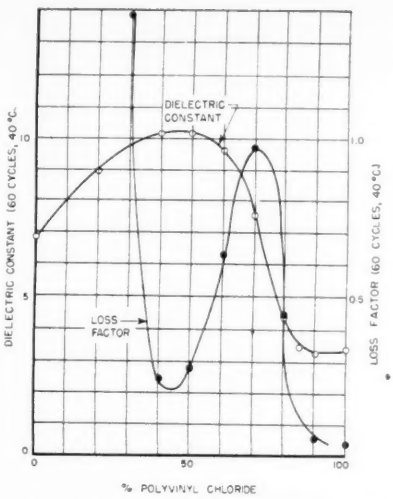


Fig. 2. Variation of Electrical Properties with Composition of Polyvinyl Chloride Plastic Containing Tricresyl Phosphate[4]

understanding of the factors involved.

Other factors such as heat and light stability are important in plastic compositions. In some instances the plasticizer is chemically unstable, and its own decomposition contributes to the development of color or opacity or other secondary effects. Tricresyl phosphate, which has been widely employed with cellulose and vinyl plastics, is an excellent example of this type of plasticizer. In other instances the plasticizer actually seems to catalyze or accelerate the decomposition of the resin. This decomposition may lead to changes in electrical characteristics, for example, and a whole series of patents has developed on the subject of stability of such mixes, especially in the vinyl chloride polymer field. An example of this is given by U. S. patent No. 2,269,900[5] which reports striking differences in electrical characteristics of plasticized polyvinyl chloride compositions depending on the plasticizer-stabilizer combination involved. These results are shown in Table 4.

TABLE 4. COMPARISON OF PLASTICIZER-STABILIZER SYSTEMS IN POLYVINYL CHLORIDE PLASTICS

	Loss Factor, 60 Cycles at 90° C.	
	Plasticized with Methyl	Plasticized with Tricresyl
Stabilizer	Hexachlorostearate	Phosphate
Lead acetate	0.33	8.35
Lead stearate	1.5	25.0
Lead oleate	2.3	17.0
Lead palmitate	1.11	11.9
Lead oxide	1.20	2.54
Lead carbonate	2.72	54.5
Lead hydroxide	1.07	8.25
Lead silicate	0.91	11.5
Lead phosphate	1.07	73.3
Basic lead carbonate	1.71	48.5
Red lead	17.1	39.8

Types of Plasticizers

Plasticizers have often been classified as solvent and non-solvent types. The solvent types are those which actually act as solvents for the resin, usually at high temperatures. The viscosity and the temperature of the actual solution may vary widely, depending on the plasticizer selected and the resinous material in question. Table 5 illustrates the type of variation experienced with a series of commercial plasticizers employing a standard resin. It is this property of high-temperature solvent action which makes it possible to mold many compositions successfully. This property is also responsible for the success of the recently developed paste technique for vinyls which depends for its success on the high-temperature fusion of a pasty mixture of plasticizer and resin after application.

TABLE 5. COMPARISON OF SOLUTION TEMPERATURES OF CELLULOSE ACETATE CONTAINING STANDARD AMOUNTS OF VARIOUS PLASTICIZERS*

(All compositions contained 66% PH Type cellulose acetate and 34% plasticizer)

Plasticizer	Solution Temperature, °C
Dimethyl phthalate	120
Diethyl phthalate	140
Dimethoxyethyl phthalate (Methox)	150
Methyl phthalyl ethyl glycollate (Santicizer M-17)	148
Triphenyl phosphate	180
Triacetin	132
Diethylene glycol dipropionate	123
Acetyl triethyl citrate	173
Dibutyl phthalate	Non-solvent
Diphenyl phthalate	Non-solvent

*Data taken from "Cellulose Acetate," Hercules Powder Co., Wilmington, Del. (1945).

The non-solvent types are essentially regarded as diluents or lubricants whose chief function is to separate the polymer molecules and to decrease the attractive forces between them. In so doing, the diluent-type plasticizers provide points of bending or flexing since they impose less resistance to distortion than does the high molecular weight resin. Consequently a certain amount of flexibility can be obtained with a non-solvent type of plasticizer.

Other schemes of classification have been employed occasionally, although not too widely. An example of such another method of classifying plasticizers is that of Jones and Miles[6] who characterized plasticizers for cellulose nitrate according to their effect on physical properties, particularly tensile strength. They recognized three groups, as follows:

(1) Plasticizers which exercised no effect on the tensile strength of cellulose nitrate; this group is exemplified by castor oil. It was shown microscopically that the castor oil was actually present as spherical droplets in the cellulose nitrate film.

(2) Plasticizers which increased the tensile strength of the composition up to a moderate concentration, then decreased the strength. Strangely enough, two extreme examples of this effect were water and tricresyl phosphate, a highly water-insoluble material.

(3) Plasticizers which increased the tensile strength of the cellulose nitrate in even high percentages. Camphor is the only actual material in this group, and it has been shown definitely that there is good evidence of a loose molecular combination between camphor and cellulose nitrate so that the somewhat anomalous behavior in this instance is not too surprising. The tensile strength referred to in this classification is corrected for the amount of secondary ingredient (plasticizer) present.

Plasticizers may also be classified by the general chemical types which they represent. Of these, esters are the most widely used types, although many other chemical types have been employed in various polymeric compositions. In general, the most successful plasticizers are high molecular weight materials of low vapor pressure. Some are actually low molecular weight polymers such as some polyesters or certain low molecular weight polybutadienes employed successfully by the Germans. Others are reactive or vulcanizable and in some cases may actually react with the polymer.

The technique of copolymerization has been employed to a considerable extent to accomplish what has been termed internal plasticization. One of the most

widely publicized examples is that of vinyl chloride and vinyl acetate which have been copolymerized to form a series of commercial vinyl resins. The effects of copolymerization on a simple physical characteristic are illustrated in Figure 3. Many other types of materials have been successfully copolymerized, and it has been possible by this means to take advantage of the inherent physical or chemical characteristics of polymers containing large amounts of such monomers as vinyl chloride, vinylidene chloride, and acrylonitrile; while at the same time it has been possible to modify their undesirable characteristics to a sufficient degree that practical commercial products are produced from what would otherwise be laboratory curiosities. The list of commercially important copolymers is a long one and includes Vinylite (V series), Saran, Pliolites S-3, S-5, and S-6, Vinyon N, Acrylo'ds, Plexiglas, Butaprene SD, Marbons S and S-1, and others.

Mixing of Plasticizer and Polymer

Several methods of incorporating plasticizers into plastic mixes are employed. The simplest is dry milling, usually on a two-roll mill of the type commonly employed in mixing rubber compounds, although most plastics require the addition of heating elements, scraper bars, and other accessories. Sometimes the mixing is carried out successfully in an internal mixer. The peculiar characteristics of the polymer involved must be observed at all times. For example, the well-known degradative effective of iron on vinyl chloride polymers necessitates the mixing of these compositions on some other type of equipment often chromium plated steel. The so-called elastomeric vinyl compositions are usually prepared in this manner.

In a few cases, such as in cellulose nitrate compositions, it is necessary to carry out a similar type of mixing in the presence of a small amount of solvent which lends some plasticity to the mass. Another very popular method consists of blending in solution and is employed for preparing dopes for fabric coating, surface coating, solution-cast films, adhesives, and other solution-derived products.

The paste technique involves mixing together the plasticizer and a careful'y prepared or selected vinyl resin by ball or pebble milling or similar techniques. The resulting paste is applied in the form desired, and the product obtained is cured by heating to a high enough temperature to cause a partial solution or fusion. The solvent-type plasticizer employed in such cases swells the resin, and the concentration solution thus formed cools to form a resilient gel.

A recently described mixing technique which is very simple, was developed by engineers of the Hungerford Plastics Corp. This process consists essentially of spray injecting plasticizer or other liquid additives into a rotating compounding chamber containing the dry ingredients, after which filtered hot dry air is passed into the mix to dry it. The compounded material remains in powder form throughout the process.

Quite a few plastic compositions are now being prepared from aqueous dispersions or emulsions of polymeric materials. Where it is desired to plasticize such compositions, the plasticizer is emulsified in water by conventional techniques, and the plasticizer emulsion is added to the resin dispersion at the proper time. It should be noted that the dry product obtained from such an aqueous dispersion contains discrete particles of polymer and discrete globules of plasticizer which have not yet interacted in the form usually found in other plastic products. It is therefore necessary to carry out a baking or fusion process, sometimes called curing, similar to the final process employed in the paste technique.

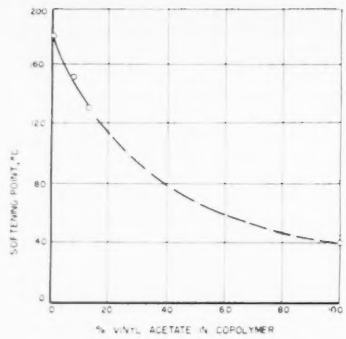


Fig. 3. Effect of Copolymerization on Softening Point of Vinyl Chloride-Acetate Resins[7]

Plasticizer Problems

Many plasticizers are selected for the applications at hand primarily on the basis of cost. This is a perfectly justifiable basis of selection provided other factors have been carefully evaluated and found to be either equivalent or insignificant. In this connection it is rather interesting to note that the price range for commercial plasticizers roughly parallels that for commercial resins. Some of the most popular plasticizers for vinyl resins, for example, have normal commercial prices very similar to those of the resins.

It is sometimes more economical to use a larger quantity of a less efficient plasticizer to accomplish a given result since the net composition may be cheapened accordingly, provided the plasticizer is somewhat less expensive than the resin. This point would be true if dibutyl phthalate, for example, were to be employed with one of the commercial vinyl chloride resins. On the other hand, a plasticizer such as dibutyl sebacate, which is somewhat more efficient with such resins than the phthalate plasticizers, cannot compensate for its increased efficiency because it is actually more expensive than the resin. Consequently no matter how small the amount of this plasticizer is employed, the net product cost is definitely higher.

To carry the analysis still further, one might compare the use of dibutyl sebacate again with a resin such as polyvinyl butyral, which is in this case more expensive than this plasticizer. Therefore for a product such as safety glass interlayer it is advisable to use a plasticizer such as dibutyl sebacate (which is desirable for other reasons) despite its relatively high cost in comparison with other plasticizers.

An unusual problem associated with the use of plasticizers is that commonly called crazing. One of the best examples of such an effect is given by cellulose acetate compositions containing highly volatile plasticizers such as dimethyl phthalate. Plasticizers for cellulose acetate are relatively few in number, and most of them are relatively volatile or possess other objectionable characteristics. Dimethyl phthalate is widely employed because it produces the desired lowering of softening point without objectionable softening of the finished product. In many applications, however, the loss of dimethyl phthalate from the surface of the plastic composition results in shrinkage, and the product actually becomes coated with a surface containing many finely divided cracks. This phenomenon is known as crazing. It is obvious that a product of a composition such as this should not be selected for an application where this type of effect is likely to occur. In other instances, loss of plasticizer may manifest itself by dimensional changes in the product.

Another effect often shown by plasticizers is that called sweating. This is sometimes known as exudation or as lubricant bloom; the latter term is preferred by ASTM (D675-45). In this case the actual limit of compatibility of the plasticizer with the polymeric material has been exceeded. Since the viscosity of the mixture is quite high, a considerable period of time elapses before plasticizer migration to the surface becomes sufficiently pronounced so that an oily or greasy film can be visually noted there. If the degree of compatibility has been greatly exceeded, sweating or lubricant bloom may occur quite rapidly. This particular effect is one which has plagued the producers of vinyl plastic products, particularly sheet material, since many producers have used available plasticizers which did not possess sufficiently high degrees of compatibility. This effect is one which need not be observed if the plasticizer has been properly chosen for the application at hand.

Absorption of water by the plastic composition is often noted. Several secondary results of this absorption may also be observed. Insulating characteristics may be destroyed. Transparency may be impaired. Actual extraction of plasticizer by water may occur with resulting dimensional changes in the product as well as significant changes in physical characteristics. It is often unwise to select a plasticizer which does a particularly good job in certain desired characteristics because of some undesirable secondary effects such as this one.

The stiffening of certain plastic compositions upon standing for considerable periods of time has been observed quite frequently. This effect may be associated with loss of plasticizer, but is often a result of crystallization of a plasticizer which is normally a solid at room temperature. Solid plasticizers, such as diphenyl phthalate, for example, are employed because of fire resistance or other desirable characteristics. The crystallization of these materials is often inhibited in the plastic composition as first prepared, and the semi-amorphous plasticizer exerts a pseudo-plasticizing action which does not continue upon standing when the solid material can crystallize. The obvious remedy for this effect is to employ only non-crystallizing plasticizers.

Another effect produced by plasticizers in many cases is that of discoloration of product. This has often been observed with plasticizers employed with cellulose nitrate where the discoloration of the composition is much greater than that caused by the resinous material itself. It is possible in many cases to stabilize these compositions against such effects. It should be noted, however, that every polymer-plasticizer-stabilizer combination seems to be specific in its net result. It is not possible arbitrarily to translate the results obtained with a given stabilizer and a given plasticizer to a composition containing some other plasticizer or stabilizer. This statement is well illustrated by the data of Table 4.

The general phenomenon known as varnish lifting or migration of plasticizer is one which is troublesome at times to the fabricator. Plastic film table covers, for

[7] Data from "Modern Plastics," Harry Barron, D. Van Nostrand Co., Inc., New York, N. Y. (1947).

example, are likely to come into contact with varnished or enameled surfaces, and the plasticizer may migrate from the film in which it is present in rather high concentration to the varnish or enamel surface with which it is apparently highly compatible. This action is apparently a form of distribution of plasticizer between two immiscible polymer phases. Not too much is known about the factors affecting this particular phenomenon although a certain body of somewhat empirical information has been built up on this subject. An obvious remedy, where it it possible to employ it, is to use a plasticizer for the one system which is incompatible with the other. Unfortunately this is often difficult to accomplish.

Another problem associated with the use of plasticizers in surface coatings is that of poor adhesion, or sometimes the loss of adhesion that was originally good. This is usually a result of exceeding the compatibility limit of the plasticizer involved, following which the plasticizer tends to sweat out or bloom at the interface between the coating and the base surface. Some materials, such as waxes, are often added to coating compositions to impart superior mar resistance or other similar characteristics, and these may also tend to bloom at the interface and thus destroy adhesion. The adhesion may also be destroyed by contact with other materials which either dissolve the plasticizer out of the composition or migrate into the composition. Examples of such materials are greases which are highly compatible with most plasticizers and which may migrate into a plasticized vinyl coating and destroy its adhesion to a metallic surface.

Recent Developments

New plasticizers appear quite frequently on the market. Many of these materials have little justification for independent existence since they represent attempts to capitalize with low-quality materials on a boom market and a plasticizer shortage. Most of such materials are not identified chemically.

In the realm of new materials several petroleum derivative materials show potentialities in the vinyl field. Several new ester-type materials have made their appearance, including fire resistant tetrachlorophthalates. Trioctyl phosphate, a superior low-temperature plasticizer for vinyls, has gone into full-scale production. A new and less expensive polyester plasticizer has made its appearance. Certain nitrile compounds have also made their appearance, and use of the sulfonamide types has continued to increase.

In addition to the low molecular weight polymers previously mentioned, it has been found that certain thermoplastic resins, such as polyvinyl acetate and polyvinyl butyral, and the nitrile-type synthetic rubbers will act as plasticizers for phenolic resins. The nitrile rubbers show a surprising compatibility with other resins and act as plasticizers for many of them. Blends of nitrile rubbers with vinyl resins show many interesting properties and are being widely exploited.

The paste technique of fabricating vinyl resins has achieved full industrial stature in the United States with the marketing of resins especially prepared for use in such processing. This technique, originally developed in Europe, will probably become an extremely important item in the American plastics industry in the next few years.

Summary and Conclusions

The uses of plastics are expanding very rapidly. Despite the increasingly large number of available resinous materials it is impossible to satisfy the complexity of demands without extensive modification of properties by compounding. Plasticizers as a class represent one of the most powerful tools in the hands of the plastics engineer, by means of which he is able to vary the properties of his materials within very wide limits.

It may safely be anticipated that more and better applications of plastics will result as knowledge concerning plasticizers and their properties becomes more widespread among plastics engineers. Widening of the horizon of plastics applications definitely requires that the plastics engineer become more informed and more self-reliant regarding the materials with which he works.

Varied Displays of Third Plastics Exposition Attract Huge Throngs

PRESENTING an array of hundreds of plastics products, raw materials, and machinery, including many items on exhibit for the first time, the Third National Plastics Exposition was held in Grand Central Palace, New York, N. Y., on September 27 to October 1. An estimated attendance of approximately 40,000 viewed the exposition, which occupied two floors of the Palace and included 130 exhibitors. William T. Cruse, executive vice president of the Society of the Plastics Industry, Inc., sponsor of the show, expressed great satisfaction with the attendance of trade representatives and buyers, including delegations from widely scattered foreign countries.

The plastics industry's renewed optimism for continued growth was evident throughout the exhibits. Deliveries of raw materials were said to have greatly improved, and many critical shortages, such as of pigments, have been virtually eliminated. These developments, together with new merchandising schemes, have lowered costs and multiplied marketing opportunities for fabricators. Indeed, some fabricators reported that their backlogs of orders have again increased to two years, offering proof that the recent recession in sales volume has ended.

Among the developments in the industry, as evidenced by the show, are: (1) larger producers of molding materials are now providing complete sales and merchandising campaigns to help move dealer inventories; (2) a wide variety of new adaptations of old products has been developed as part of this sales campaign; (3) some new products and wider uses of plastics as substitutes for scarce metals have been developed; and (4) a drive to lower consumer costs has developed among competitive products. Several fabricators have also started drives to expand sales in the export field.

A feature of the exposition was the 30 prize-winning entries in the Seventh Modern Plastics Competition, sponsored by *Modern Plastics*. These products were selected as the best in their respective fields from the 7,000 products entered in the competition. The Navy Department's Bureau of Ships had an exhibit featuring a plastic-hulled "personnel carrier" boat said to be the largest single plastic object ever molded in one piece.

Materials Exhibits

The American Cyanamid Co. display was devoted to the overall contribution of a chemical company to the plastics industry. Although featuring plastic molding materials and products, including new Melmac tableware and translucent buttons, the exhibit also included related products such as textile treating resins, paper resins, dyes and pigments, surface coatings, and lubricants. One of the most diversified and extensive groups of plastic products ever assembled was by Bakelite Corp. The Bakelite exhibit included a "plastic kitchen" which was practically 100% plastic except for the plumbing; polyethylene in medical and packaging applications; electrical insulations of all types; vinyl and polyethylene monofilaments and fabrics in various applications; and vinyl film products of all types.

The Borden Co. exhibit co-featured products made from its Durite phenolic plastics and applications involving Casco resin adhesives. Decorative merchandise, plastic structural items, and various resin applications were shown by the Catalin Corp. of America. The Celanese Corp. of America stressed applications of Lumarith XF, a new heat and flame resistant cellulose acetate especially suited for electrical uses. Departing from its custom in previous shows, Dow Chemical Co. featured its six-point merchandising and consumer product evaluation program, with displays illustrating the plan's operation. Dow also exhibited two new polystyrene plastics, Styrons 475 and 637, whose improved properties offer wider fields of application for these versatile materials.

E. I. du Pont de Nemours & Co., Inc., showed a new use for Lucite in three-dimensional advertising signs and also featured industrial and consumer uses of polyethylene packaging film, nylon, Teflon, and acetate plastics. Phenolic plastics for industry were displayed by Durez Plastics & Chemicals, Inc.; while the exhibit of General Electric Corp. emphasized the versatility of its plastics in different fields of application. A set-up to process Geon polyblend completely was handled by B. F. Goodrich Chemical Co., which also displayed end-products illustrating the versatility of its Geon resins plastics, and latices. Goodyear Tire & Rubber Co. divided its display into exhibits of the use of the new Tuf-Lite resin-rubber blend in athletic equipment and the use of its new Pliovic vinyl plastic in films, tubing, gasketing, hose, and other products.

Hercules Powder Co. featured its cellulosic plastics including the new flame resistant cellulose acetate. The new P-8 heat resistant polystyrene was shown by Koppers Co., Inc., with demonstrations of the material's resistance to immersion in boiling water. The first public showing of Marvinol VR-10 vinyl resin was made by Glenn L. Martin Co. in a display emphasizing the company's statement that the plastic is more versatile and economical than the many single-purpose resins now

Booth of Koppers Co., Inc., at Plastics Show

in the vinyl plastics field. Monsanto Chemical Co. featured items ranging from air conditioner parts to toys which have been converted from other materials to plastics since the end of the war. The only display of cold molding materials at the exposition was shown by Mylar Plastics Corp. in the form of the new Gladite powder.

Nixon Nitration Works had on hand products employing its cellulose plastics. Owens-Corning Fiberglas Corp. presented applications of Fiberglas in preform molding, reinforced plastics, and Doron body armor. The exhibit of the Plaskon Division, Libbey-Owens-Ford Glass Co., called attention to the new alkyd molding material, a new molding machine designed for handling the new plastic, and the use of plastic buttons to provide multiple-use garments for limited budgets. The use of Plexiglas in outdoor advertising signs was also featured by Rohm & Haas Co. Besides displays of Tenite in end-products, Tennessee Eastman Corp. demonstrated a new, low-cost method of making Tenite sheet material by continuous extrusion.

Machinery Exhibits

A complete line of hydraulic equipment for the plastics industry, including presses, pumps, and accumulators, was shown by Elmes Engineering Works of American Steel Foundries. Injection molding machines and granulating machines were displayed by Fellows Gear Shaper Co. A new high-speed vertical injection machine was featured by Giddings & Lewis Machine Tool Co., while Hydraulic Press Mfg. Co. showed its injection machines and transfer, compression, and laminating presses. Injection machines were also exhibited by Lester-Phoenix, Inc., and the MacRay Engineering Co. demonstrated a new semi-automatic injection molder. A complete line of extruding machines formed the display of Modern Plastic Machinery Corp.; while Moslo Machinery Co. showed its new Minijector, a 1½-ounce injection machine.

The National Rubber Machinery Co. featured extruders, wire covering units, take-up and cooling units, take-off conveyers, drying cabinets, and granulators. Hand presses were displayed by Preco, Inc.; and injection machines by Reed-Prentice Corp. A complete line of automatic and semi-automatic molding presses was featured by F. J. Stokes Machine Co., including three new models. Tumbling barrels, mold base assemblies, and injection machines comprised the booth of Van Dorn Iron Works Co. The Watson-Stillman Co. exhibited transfer, compression, and injection machines, hobbing presses, and tableting presses.

Electronic and high-frequency equipment was featured by seven companies, including W. T. LaRose & Associates, Inc., Mayflower Electronic Devices, Inc., and Radio Receptor Co. Other equipment shown at the exposition included leaf stamping machines, valves, testing machines, steam boilers, preform conditioning apparatus, and distillation units.

Exhibit of American Cyanamid Co. at National Plastics Exposition

Other Exhibits

As in previous expositions, the exhibits of custom molders were prominent. Among the companies in this category were Anchor Plastics Co., Inc., with curved extrusions; Lumite Division, Chicopee Mfg. Corp., with Lumite insect screening and upholstery fabrics; Columbia Protektosite Co., Inc., with plastic partition blocks; Industrial Synthetics Corp., with Supplex polyvinyl garden hose; Plastic Developments, Inc., with Clear-Float products consisting of items suspended in crystal plastic blocks; Polyplastex United, Inc., with Fiberglas-resin lampshades and screening; Plax Corp., featuring oriented polystyrene; and Shaw Insulator Co., with new one-piece polyethylene caps and closures for squeeze-type plastic bottles.

Among the fabricators at the fair, processors of vinyl sheeting and sheeting products were in great evidence. Included among this group were Respro, Inc.; Rubber Corp. of America, showing its Rucoam film and sheeting; Toscony Fabrics, Inc.; and Velveray Corp. Exhibits of laminators were also much in evidence and included displays of its new MoonGlo pattern by Formica Insulation Co., and varied exhibits by Synthane Corp., Keyes Fibre Sales Corp., and Westinghouse Electric Corp.

Plastics Remobilization

The remobilization program as it concerns the plastics industry was the subject of special meetings held on September 28 and 29 at the Commodore Hotel, New York, N. Y. The meetings, sponsored by the SPI and coincident with the Third National Plastics Exposition, featured reports by government representatives on plastics products for the Ordnance Department, Signal Corps, Quartermaster Corps, Bureau of Ships, and Chemical Warfare Corp. Gordon M. Kline, National Bureau of Standards, and N. J. Rakas, National Automotive Fibres, Inc., presided over the meetings.

PMMA Research Project Film

A PRESS preview of a motion picture demonstrating the development of the research project in plastics sponsored by the Plastics Materials Manufacturers Association in the laboratories of the Massachusetts Institute of Technology was held for scientific and technical editors on September 29 at the studio of Films for Industry in New York, N. Y.

This sound and color film prepared by The Society of The Plastics Industry, Inc., shows a large testing machine capable of performing measurements of the strength of plastics materials under tension and compression. Servo mechanism, a type of electronic control developed for army gun computers and rate setters, enable the tester to subject the materials to types of physical tests not hitherto feasible. In addition, the instantaneous recording of data and other devices developed by the project make possible tests involving temperature, torsion, bending, and constant rates of load and movement.

Molecular composition of samples tested is determined from the test piece by use of a turbidimeter. The specimen is dissolved and placed in the path of a ray of light. Upon addition of a precipitant, the solution becomes cloudy, according to the size and the changes in transmission of light occasioned by the polymer molecules in the sample.

The benefit of this research to consumers is illustrated in the final portion of the film, where prize-winning manufactured plastic products from the 1948 Modern Plastics Competition are shown.

This 16 mm. sound and color film takes approximately 20 minutes to run and will be made available to groups that are interested.

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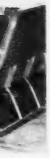

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(VFF)
VERY FINE FURNACE

HIGHER LOADINGS... BETTER ROAD WEAR

- The controlled structure of STATEX-K makes possible higher loadings without processing difficulties.
- In GRS treads, normal loadings have shown 15% better road wear than with EPC. Higher loadings result in even better performance.
- In Natural Rubber too, the better wear provided by STATEX-K over EPC is increased by higher loadings.

COLUMBIAN CARBON COMPANY

500 TONS OF SMOKE A DAY

COLUMBIAN CARBON CO. MANUFACTURER · BINNEY & SMITH CO. DISTRIBUTOR

MPC (Medium Processing Channel)

STANDARD MICRONEX

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EPC (Easy Processing Channel)

MICRONEX W-6

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HMF (High Modulus Furnace)

STATEX-93

◆

FF (Fine Furnace)

STATEX-B

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VFF (Very Fine Furnace)

STATEX-K

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FEF (Fast Extruding Furnace)

STATEX-M

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SRF (Semi-Reinforcing Furnace)

FURNEX

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COLUMBIAN CARBON CO. MANUFACTURER

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New Season's Activities under Way by SPE Sections

THE New York Section, Society of Plastics Engineers, Inc., held its second regular dinner-meeting of the season on October 7 at the Hotel Sheraton, New York, N. Y. Approximately 33 members and guests heard J. A. Koons, Process Mold Co., give a very interesting talk on "Cast Beryllium Copper Cavities and Forces." Instead of reading a formal paper on the subject, Mr. Koons displayed numerous beryllium copper cavities and forces together with products made in such molds for the automotive, refrigerator, toy, novelty, air conditioning, and other industries. The speaker covered his subject by means of explanations of the factors involved in making each mold or product and by his answers in the lively discussion period which followed the talk.

The beryllium copper Hi-Pressure-Cast cavities and cores made by Process Mold are produced by pouring the alloy around a master steel hob and applying high pressure while the metal is in the molten state. By this means it is possible to produce cavities that cannot be hobbed cold in steel, but which can be made with great clarity of detail, uniform density, and irregular parting lines, in any shape or design, and with a surface area of up to 144 square inches. Because a master beryllium cavity is made from the initial hob, a customer can supply a steel hob and obtain both forces and cavities in beryllium.

The original hob supplied by the customer should be made of air-hardening steel. The hob base should have a minimum thickness of two inches and have several $\frac{1}{2}$-13 holes drilled and tapped at bearing points to provide means of fastening down. The width and the length of the hob block must be in even inches, and $\frac{1}{8}$-inch much be allowed on the parting line at the top of the hob. This allowance permits machining the face of the resulting cavity. Where dimensional precision is required, the hob must allow 0.004-inch per linear inch for shrinkage during casting of the beryllium. The hob must then be hardened and given the specified surface finish.

The beryllium cavities and forces are supplied in either annealed or "as cast" condition. Upon receipt, the customer is required only to machine the outside diameter of the cavity to square up the cavity blocks, drill for the core pins, and harden by placing the cavities into a box-type furnace at 575-600° F. for three hours. The parts are then removed and allowed to cool in still air. Before using, the cavities are polished and given a flash chrome plating; the plating is necessary for compression molding, thermosetting applications, and rubber molding.

The Section's next meeting, scheduled for November 9 at the Hotel Sheraton, will feature a talk by Harold Narcus, Electro Chemical Industries, Inc., on "Plating of Plastic Molded Parts."

The Mechanics of Dry Extrusion

The first meeting of the fall season of the Western New England Section took place September 9 at the Hotel Sheraton, Springfield, Mass. In the absence of Section President F. J. Donahue, Monsanto Chemical Co., the meeting was presided over by Vice President Sherwood L. Young, C. F. Church Mfg. Co.

The technical session featured a paper on "The Mechanics of Dry Extrusion" by T. Kresser and E. A. Haddad, Monsanto. Mr. Kresser presented the paper, which opened with a short summary of the importance and development of dry extrusion. The geometry of a screw-type extruder was discussed and illustrated, and a force balance was used to derive the relation between the principal forces acting in an extruder. The nature and relative magnitudes of these forces were discussed in detail, and conclusions drawn regarding the design and the operation of such extruder.

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The Chicago sections of SPE and SPI held a joint meeting on October 13 in the Builder's Club, Chicago, Ill., with approximately 120 members and guests of the two societies in attendance. Featured speaker was Amos Ruddock, Dow Chemical Co., who discussed "Merchandising in Plastics."

After a review of the poor public relations which the plastics industry as a whole has with newspapers and magazines, Mr. Ruddock advocated a concerted publicity campaign by the trade associations and materials suppliers to sell the public on the use of plastics, not as substitutes, but as products best suited for the applications concerned. The speaker recommended the adoption of a program of constructive merchandising which would combine advertising with improved consumer relations. Some of the areas where consumer relations may be profitably improved are in public relations, the presentation of new developments to newspapers and magazines, the distribution of plastic products, and retailer relations. On the subject of retailer relations, Mr. Ruddock emphasized the importance of informative labeling, continuous education of sales personnel on the special properties of the plastic products, and the establishment of fixed sales policies which protect both the retailer and the manufacturer.

The two sections held a joint golf tournament on September 23 at the Westward-Ho Country Club, Melrose Park, as the first step in the program of close cooperation between the local sections of the two organizations. About 70 members and guests participated in the golf tournament, and 90 were present at the dinner which followed.

Arrangements for the tournament were made by a committee consisting of Chairman J. Ferguson, Plaskon Division, Libbey-Owens-Ford Glass Co.; V. Wright, *Modern Plastics;* R. Stephens, Kurz-Kasch, Inc.; and G. Roxburgh, Celanese Corp. of America. Winning contestants follow: blind bogey, Floyd Gunn, Dow Chemical Co., C. Whitacre, Midwest Plastics Co., and H. E. Murray, Plaskon Division; and low net by the Peoria System, Fred Raymond, T. Walker, T. V. Serrell, and D. Sergusa. Following the dinner, short talks were given by Mr. Ferguson, vice president of the local SPI section, and Wm. Hess, Anesite Co., chairman of the local SPE section, explaining plans for future joint meetings of the two sections and the program of closer cooperation in the future between the two societies.

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Prices and Sales Terms Analyzed

The Newark Section held its first dinner-meeting of the current season on October 13 at the Newark Athletic Club, Newark, N. J. Featured speakers were Harry F. Eels, Jr., Celanese Corp. of America, who discussed "Price Analyzation," and William H. Nussbaum, Columbia Protektosite Co., who spoke on "Interesting Angles behind the SPI Sales Terms."

Mr. Eels said that prices are the only media available to reacquire costs and realize profits. It is therefore essential to analyze carefully each element contributing to the price. To accomplish this aim one must be qualified to evaluate the product, facilities, costs, market and merchandising policies, and profit requirements. Mr. Nussbaum began his talk with a review of the work done by the SPI accounting and financial committee in preparing the Conditions of Sale given in the SPI "Uniform Accounting Manual for the Plastics Industry." The component parts of these Conditions were then discussed in detail, including discount terms, mold sales and maintenance terms, shipping terms, etc. The speaker pointed out the wide disparities in these terms as used by different plastics companies and the advantages to be gained by use of standard terms and conditions of sale.

Informal New Orleans Meeting

The New Orleans Section held a business meeting on October 7 in the display room of Plastics Productions, Inc., host for the meeting. Chairman H. A. Levey, American Products Mfg. Co., presided at the session which was brief and informal in nature. Mr. Levey announced that a qualified speaker had been obtained from the Southern Regional Research Laboratories, Department of Agriculture, for the annual convention of the Louisiana Engineering Society next February. Two proposed subjects for the speaker are "Plastics as Materials for Construction" and "Plastics in Construction Applications." These subjects will be discussed at the group's next meeting in November. The meeting ended after a talk by Mr. Levey on his trip to the recent third National Plastics Exposition.

Hobson Cites Advantages of Polystyrene

The Southern California Section, SPE, and Pacific Coast Section, SPI, held a joint dinner-meeting on October 21 at the Mayfair Hotel, Los Angeles. Seventy members and guests of the two groups heard E. L. Hobson, sales manager of the plastics division, Monsanto Chemical Co., speak on "The Impact of Polystyrene on the Plastics Industry."

The expansion in use of polystyrene since its introduction 10 years ago has been phenomenal, Mr. Hobson said. Since June of this year polystyrene has been outselling phenolic molding powder, and producers of polystyrene are operating at near capacity. After a review of the adoption and growth of polystyrene plastics in this country, the speaker gave the following reasons for the growing popularity of polystyrene: (1) its outstanding physical properties, including low cold flow, stability under varying temperature and service conditions, good strength over wide temperature ranges, color versatility, non-warpage on aging, and excellent heat resistance; (2) its low cost; (3) its ease of molding; and (4) its availability. This growth in polystyrene use has had a great impact on the consumer, since practically all applications are designed for the mass market. As for future applications, packaging uses for polystyrene have hardly been touched to date, Mr. Hobson declared, and the extrusion field has not as yet utilized polystyrene to its fullest advantage. Future improvements in this material that can be expected in the next few years include higher heat resistance, improved resilience, and increased moldability, while machine developments to handle the molding of 40- to 80-ounce parts are also to be expected. The speaker concluded with a discussion of stress cracking in polystyrene and the use of annealing to prevent such failure in service.

Thayer Addresses Rochester Section

The Rochester Section, SPE, held its first regular dinner-meeting of the new season on October 19 at Lorenzo's Restaurant, Rochester, N. Y. In all 47 members and guests heard a talk on "Injection Molding of Thermoplastic Materials," by Gordon Thayer, Dow Chemical Co., followed by a lively question and answer period. Mr. Thayer's talk emphasized the subject of mold design for the molding of polystyrene and covered the problems arising in this work and their solution. The group's next meeting will take place on November 16 at Lorenzo's Restaurant.

Goodyear's Tuf-Lite

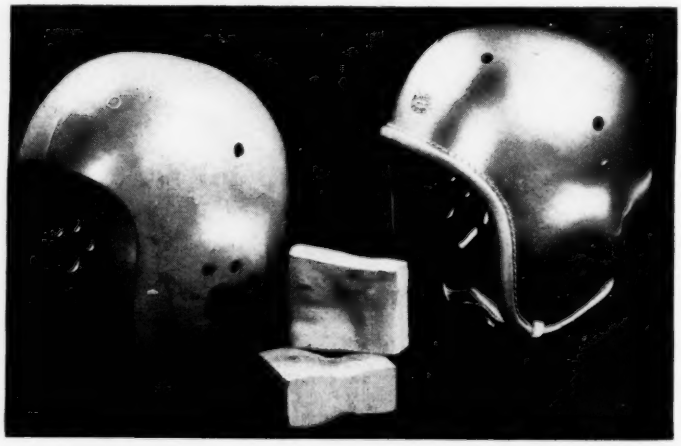
THE generic name, Tuf-Lite, has been assigned to cover the new series of plastic materials developed by the chemical division of Goodyear Tire & Rubber Co., Akron, O. Made by the addition of low proportions of the various natural and synthetic rubbers to plasticize Pliolite S-3 or S-6 high-styrene copolymer resins, the resultant blends are tough, light, and highly impact resistant. Although the properties of Tuf-Lite depend on the particular combination and the specific proportions of resins and rubbers used and on the type and the method of compounding and curing, the entire group can be characterized by the following properties: high impact resistance, low water absorption, easily compounded and post formed, excellent working characteristics, flexibility in physical properties, and wide color range. Almost all of the common rubbers have been used successfully in combination with the resin; the best impact resistance is obtained with GR-S, nitrile, and natural rubbers; while neoprene and Butyl give stocks of good tensile strength, but somewhat lower impact resistance.

Tuf-Lite is prepared as follows: (1) band the resin on a hot mill; (2) blend in the rubber; (3) add the curing ingredients; (4) extrude or calender the raw stock; (5) prepare the stock for the mold, and granulate if necessary; (6) load and cure in the mold; and (7) remove the cured piece from the mold, allow to cool, and trim edges. Compression molding has given the most satisfactory production of finished items, and excellent glossy finishes can be obtained. The material can be readily post formed, machined, sawed, drilled, and buffed, and articles too large or irregular to be molded conveniently can be made with conventional wood or metal equipment. Applications for Tuf-Lite include football and safety helmets; other body protective equipment; golf club heads and ball covers; bowling balls and coverings; clicker pads; electrotype printing plates; carrying cases; and others.

Reinforced Plastics Division

THE former low-pressure industries division has been renamed the reinforced plastics division, according to the Society of the Plastics Industry, Inc., 295 Madison Ave., New York 17, N .Y. This change in name has been authorized by the division's steering committee as the result of an industry vote, but the plastics products covered will remain essentially the same.

It was also announced by the SPI that the division will hold its fourth annual technical session at the Edgewater Beach Hotel, Chicago, Ill., on January 12 to 14, 1949. The program will also include a product and equipment exhibit. Robert J. Brinkeme, Egmont Arens, is general chairman of the division. Program chairman for the January meeting will be Harold Freeman, American Cyanamid Co., and Leonard Meyer, Western Products, Inc., will be chairman of the exhibit committee.



The Two Small Slabs of Tuf-Lite *(Center)* Are Molded into the Football Helmet Shell *(Left)* for the Finished Helmet *(Right)*

Plastics Expansion Forecast

AN INCREASING array of new plastic products is promised by the recent enormous expansion of the plasticizer industry, now close to a $100,000,000 per year production peak, according to Arthur K. Doolittle, assistant director of research, Carbide & Carbon Chemicals Corp. Speaking before a meeting of the North Jersey Section, American Chemical Society, in the Winfield Scott Hotel, Elizabeth, N. J., on October 11, Mr. Doolittle said that the output of plasticizers has soared from 15 or 20 million pounds per year before the war to about 200 million pounds at present.

"Few people not directly associated with this field realize that a huge new industry has developed right before their eyes," he stated.

With so much research in progress and so much activity in the plastics industry, we may look forward with confidence to an increasing number of new plastic products to meet the evergrowing demand, the speaker further declared. Among the newer developments mentioned were the oxo process for producing plasticizing alcohols by the use of certain petroleum ingredients, hydrogen, and carbon monoxide, and the new use of plasticizers in plastisols or resin-plasticizer pastes.

Kel-F—New Thermoplastic

COMMERCIAL production in limited quantities of Kel-F, a new, unusually stable, high-temperature thermoplastic, has been announced by M. W. Kellogg Co., Jersey City, N. J. Developed by the company's scientists in consultation with W. T. Miller, of Cornell University, the new plastic is a polymer of trifluorochloroethylene; four-fifths of its weight is made up of fluorine and chlorine.

In its natural state Kel-F is colorless and transparent, but can be blended with solid fillers and coloring agents. The plastic has the following properties: specific gravity, 2.1; tensile strength at 86° F., 9,400 p.s.i.; elongation at 86° F., 127%; coefficient of linear expansion from —320 to 167° F., 3.5×10^{-5}; specific resistance, 5×10^{17} ohms; dielectric strength, short time, 2,500 volts/mil; dielectric constant at 60 to 10^9 cycles, 2.3-2.7; and water absorption, 0.00%.

The new material exhibits the high stability properties of the fluorocarbon family, to which it is closely related, in combination with an unusual balance of commercially useful physical properties. Kel-F has excellent resistance to weathering and to chemical action. No effect has been observed after prolonged exposure to concentrated sulfuric, hydrofluoric, and hydrochloric acids, strong caustic, fuming nitric acid, aqua regia, and other strong oxidizing materials. Its chemical resistance makes it highly suitable for use in pump packing, valve seats, and valve packings handling corrosive gases and liquids; also for laboratory and instrument tubing because it combines good rigidity, transparency, and flexibility with its inertness and cold flow characteristics.

Kel-F has satisfactory properties over the temperature range from —320 to 390° F. and is therefore suited for use in liquid air and oxygen plants, refrigerating systems, and in low-temperature chemical reaction systems. Its good heat and electrical insulation properties suggest its use in electrical equipment designed for high-temperature service. The new material, it is further claimed, has good fabricating qualities and may be handled by conventional machinery designed to operate in the range of 550-600° F. It may be compression, transfer, or injected molded or extruded and has been fabricated in the form of sheets, films, tubing, rods, shaped pieces, and wire insulations. It can be readily punched, drilled, or machined to close tolerances. Kel-F is also very sensitive to heat treatment, and stable properties at service temperatures can be obtained by suitable heat treatment at considerably higher temperature. In this way the plastic may be made relatively soft and resilient, or harder and less yielding, without any sacrifice in stability properties.

CALENDAR

Nov. 23.	Washington Rubber Group.
Nov. 26.	Cleveland Section, SPE.
Nov. 28-Dec. 3.	ASME. Annual Meeting. Hotels New Yorker and Pennsylvania, New York, N. Y.
Nov. 29-Dec. 4.	18th National Exposition of Power & Mechanical Engineering. Grand Central Palace, New York, N. Y.
Dec. 3.	Philadelphia Rubber Group.
Dec. 7.	The Los Angeles Rubber Group, Inc.
Dec. 10.	New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Dec. 10.	Detroit Rubber & Plastics Group, Inc. Christmas Party, Detroit Leland Hotel, Detroit, Mich.
Dec. 10.	Southern Ohio Rubber Group. Dinner-Dance. Miami Valley Country Club, Davton, O.
Dec. 11.	Southern Ohio Rubber Group. Christmas Party. Miami Valley Golf Club.
Dec. 14.	Buffalo Rubber Group. Christmas Party. Westbrook Hotel, Buffalo, N. Y.
Dec. 14.	New York Section, SPE. Hotel Sheraton, New York, N. Y.
Dec. 15.	Newark Section, SPE. Newark Athletic Club, Newark, N. J.
Dec. 15.	Rhode Island & Southeastern Massachusetts Section, SPE. Providence Engineering Societies Bldg., Providence, R. I.
Dec. 17.	Chicago Rubber Group. Christmas Party. Hotel Morrison, Chicago, Ill.
Dec. 17.	Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.
Dec. 21.	Rochester Section, SPE.
Dec. 28.	Washington Rubber Group.
Jan. 4.	The Los Angeles Rubber Group, Inc. Hotel Mayfair, Los Angeles, Calif.
Jan. 10-14.	SAE. National Meeting and Engineering Display. Hotel Book-Cadillac, Detroit, Mich.
Jan. 12-14.	SPI Reinforced Plastics Division. Fourth Annual Technical Session and Exhibit. Edgewater Beach Hotel, Chicago, Ill.
Jan. 14-21.	National Sporting Goods Exposition and N.S.G.A. Convention. New Coliseum, Chicago, Ill.
Jan. 18.	Buffalo Rubber Group, Westbrook Hotel, Buffalo, N. Y.
Jan. 19-21.	Society of Plastics Engineers. Annual Conference. Bellevue-Stratford Hotel, Philadelphia, Pa.
Jan. 25.	Washington Rubber Group.
Feb. 4.	Chicago Rubber Group. Hotel Morrison, Chicago, Ill.
Feb. 18.	Akron Rubber Group. Winter Meeting. Mayflower Hotel, Akron, O.

Monsanto Developments

THE plastics division, Monsanto Chemical Co., Springfield, Mass., has begun commercial production of vinyl chloride resins. Felix N. Williams, company vice president and general manager of the division, said that present facilities for manufacturing resin will be followed shortly with calenders to produce both thin- and heavy-gage film. Both resins and film will be sold under the trade name Ultron.

Made of Monsanto's Lustron polystyrene plastic partition blocks resembling glass brick, but having only one-fifth the weight of glass brick are available for use in the home, store, or business office. Molded by Columbia Protektosite Co., Inc., the blocks are made with interlocking lips permitting non-load bearing walls to be built without the use of adhesives or clamps. Mastic cement or wood strips between the blocks can be used to make a permanent wall. The new blocks are recommended at present only for interior installations.

The use of plastics in the manufacture of toys is still on the increase, despite increased availability of other materials, according to F. A. Abbiati, assistant general manager of Monsanto's plastics division, who stated that almost 40% of the toy industry's 350-500 million-dollar 1948 sales will be for items made of plastics. This boom in plastic toys has been aided by the demand for realistic toys. With plastics this realism of detail can be molded into the toy in a single operation.

Sawdust and wood chips can be easily made back into usable forms of wood with only the addition of minor amounts of a plastic material, according to Nicholas N. T. Samaras, division research director. The resulting product, pressed boards, can be sawed, turned, and otherwise handled like wood. The board has no grain, therefore is not subject to splitting, and weighs approximately the same as the wood from which the sawdust was derived. In manufacture, the wood chips or sawdust is mixed with 5-15% Resinox and molded under pressure.

The plastics industry can now report that its products are the country's most available raw material, according to James R. Turnbull, general manager of sales for the plastics division. Despite the fact that plastics consumption has doubled since 1945, plastic molders and fabricators are the only large segment of American industry not troubled by materials shortages, Mr. Turnbull said. The total consumption of plastics and resin in 1947 was 850,000,000 pounds, and the Monsanto executive estimated that this year's consumption will reach 1,500,000,000 pounds.

The Springfield plant recently established a safety record of more than one million consecutive man-hours without a lost-time injury, the sixth time in the last 10 years that the plastics plant has made the same record. The plant average of 2.4 injuries per million man-hours compares favorably with the national average for all industries of 13.26 and with the national chemical industry average of 8.86. Earlier this year the plant was the winner in a company-wide safety and housekeeping contest.

Scientific and Technical Activities

Rubber Division, A. C. S., Fall Meeting Program

THE program and the abstracts of the papers to be presented at the fall meeting of the Division of Rubber Chemistry, American Chemical Society in Detroit, Mich., on November 8, 9, and 10, at the Book-Cadillac Hotel, have been announced and are given below. Monday morning, November 8, will be devoted to registration, and technical sessions will start at 2:30 p.m. on that day and continue at 9:00 a.m. and 2:00 p.m., on November 9. The final session will begin at 9:15 a.m. on November 10.

H. E. Outcault, St. Joseph Lead Co., chairman of the Division, will preside at the technical sessions, assisted by C. R. Haynes, Binney & Smith Co., secretary. Mr. Outcault will also preside at the business meeting scheduled for 11:20 a.m., November 9 and at the banquet during the evening of that same day. The results of the election by letter-ballot of officers and directors of the Division will be announced, and a report of a committee on changes in by-laws, headed by H. I. Cramer, Sharples Chemicals, Inc., will be heard at the business meeting. There will be no speakers at the banquet, but the usual program of entertainment will be provided.

There will be a luncheon meeting of the 25-Year Club on November 8, at which time reports of the nominating, eligibility, and name committees of this new organization will be heard. W. G. Nelson, United States Rubber Co., is chairman of the committee for the luncheon meeting.

The local committee on arrangements for the Division meeting includes: C. W. Selheimer, Illinois Institute of Technology, chairman; W. B. Davies, Kaiser-Frazier Corp., vice chairman; J. W. Temple, U. S. Rubber, registration; E. J. Kvet, Baldwin Rubber Co, treasurer; George Wolf, Sharples Chemicals, banquet; G. R. Cuthbertson, U. S. Rubber, meeting rooms; G. F. Lindner, Minnesota Mining & Mfg. Co., information and hospitality; and Mr. Nelson.

The titles, authors, and abstracts of the 22 papers to be given at the four technical sessions are as follows:

Monday Afternoon—November 8

EPC Channel Blacks Modulus Study. A total of 88,700,000 pounds of EPC channel black has been used for the production of GR-S Black masterbatches at the Office of Rubber Reserve plant operated by The General Tire & Rubber Co. at Baytown, Tex., during the 30-month period from January 1, 1946, through June 30, 1948. A total of 50,600,000 pounds of the above EPC channel black has been tested on a dry mill basis, by incorporation of 50 parts of channel black, taken from representative covered hopper car sampling, with 100 parts of standard GR-S reference control, with completion of compounding, curing, and tensile testing according to ORR specifications. Data accumulated represent testing on 767 hopper cars of EPC channel black.

Data are reported representing five different producing companies and 16 different fields identified only by Roman numerals and capital letters, respectively. Results are reported for 25- and 50-minute modulus in p.s.i. at 292°F. at 300% elongation and compounded Mooney viscosity (4' ML). These data have all been corrected for individual simultaneous reference control testing and have then been corrected to one common reference control level. Factual results only are reported as a matter of record and to present this information to the industry as a whole. J. Q. McGiffin (General Tire & Rubber Co., Baytown, Tex.).

An Acceleration Study Using Reinforcing Furnace Blacks in Natural Rubber Treads. Reinforcing furnace blacks as replacements for channel blacks in natural rubber tread formulations are receiving increased interest throughout the industry. The major difficulty encountered in their use has been a definite processing scorch problem introduced by their inherent high pH and consequent low accelerator adsorption values. Reduction of common accelerators and/or sulfur loadings to various degrees of starvation improves scorch resistance to some extent, but only at the expense of hysteresis, set, and other important properties in the vulcanizates.

Further expansion in the use of these furnace blacks is justified by the data of this study in which mixed aliphatic thiazyl disulfides are used for acceleration in combination with n-nitroso diphenyl amine for retardation. With this accelerator combination, adequate freedom from scorch is achieved without detriment to other important physical properties in the vulcanizate. The effect of a concentration range of both sulfur and retarder is shown, and comparisons are made with a standard EPC tread stock used as a control. The RF black vulcanizates are shown, by all physical tests, equal to and in many ways superior to the similarly loaded EPC black control compound. W. H. Heinlen, Jr. (B. F. Goodrich Chemical Co., Cleveland, O.).

Power Consumption Studies on Natural and Synthetic Rubber Compounds. A power study has been made on a "B" size laboratory Banbury and a standard No. 11 Banbury. The study was made primarily to determine the effect of X-435 polymer (41°F. cumene-hydroperoxide) on power requirements. The work has been amplified to include the effect of certain standard types of carbon black and plasticizer-black ratios and finally the effect of mixing variables. It was found that X-435 requires more power than GR-S in approximate relation to its higher Mooney value and that types of black have a pronounced effect on power consumption not necessarily in order of their respective particle size, but apparently depending on the type of hydrocarbon in which they are used. Power requirements of certain type tread mixes exceed the capacity of some existing equipment imposing severe repeated overloads. Judicious blending of blacks may be used successfully to reduce these overloads. The effect of black-plasticizer ratio is shown, and various mixing methods which will reduce power consumption are discussed. A. H. Nellen, W. B. Dunlap, Jr., and C. J. Glaser, Jr. (Lee Tire & Rubber Corp., Conshohocken, Pa.).

The Effect of Compounding Variables upon the Low Temperature Behavior of Butadiene-Styrene Synthetic Rubbers. The serviceability of butadiene-styrene synthetic rubber stocks at low temperatures is dependent upon the compounding materials used. The type and the amount of plasticizer are of particular importance. Data are shown for the changes in stiffness at various low temperatures for GR-S containing a number of good low temperature plasticizers.

A comparison was made of the low temperature stiffening of polybutadiene containing the thermatomic P-33 black and easy processing channel black. Improvement in the low temperature flexibility of GR-S without too great a deterioration of physical properties at normal temperatures can be achieved by the use of combinations of increased black and increased plasticizer.

The degree to which polybutadiene and 85-15 butadiene-styrene compounds are vulcanized has an important relation to the permanent set which the stocks assume after static compression at —57° C. The tensile and elongation at —42° C. and at —57°C. have been investigated for several stocks of varied freezing points. R. D. Juve and J. W. Marsh (Goodyear Tire & Rubber Co., Akron, O.).

The Compounding of O-Ring Hydraulic Packings. This paper discusses some of the general and specific requirements for O-ring hydraulic packings and presents some aspects on the compounding of O-rings to meet these requirements. Such packings are widely used in aircraft, automobiles, locomotives, hydraulic presses, and many other pieces of equipment and machinery employing hydraulic methods of motivation or activation. Aircraft applications represent the most severe types of use in general and are discussed in detail in this paper.

The general requirements for an O-ring for aircraft applications are that it should be made to close dimensional tolerances; it should not be adversely affected by the hydraulic oil employed; it should withstand working hydraulic pressures without leakage; it should seal at both high and low temperatures; it should have low friction, and it should have a long life expectancy.

The specific requirements for O-rings, as given in the Army-Navy Aeronautical Specification AN-P-79, are discussed. The tests listed in the specification are classified as tests for control, for the evaluation of O-rings in terms of properties believed requisite for performance, and for simulation of service conditions.

The aspects of compounding O-rings discussed include the factors influencing the selection of the base polymer, the curing system, reinforcing agents, and plasticizers. Richard A. Clark and LaVerne E. Cheyney (Battelle Memorial Institute, Columbus, O.).

Tuesday Morning—November 9

Reclaiming Synthetic Rubber. This paper reviews the progress made by the reclaimed rubber industry from 1938 to 1948 in reclaiming rubber scrap containing synthetic rubber. A quick method of estimating the synthetic hydrocarbon content of an unknown mixture is described. Experiments showing the effect of fine grinding, synthetic rubber content, the use of peptizers, and the use of alkaline or neutral digestion media on the reclaimed rubber product are reported. Some statistics illustrating the concentration of synthetic rubber in tire scrap are given. Reports on tire performance obtained with

synthetic reclaim are included. Recipes containing synthetic reclaimed rubber are given which are recommended for mechanical goods of varying degrees of Shore hardness. F. L. Kilbourne, Jr. (Xylos Rubber Co., Akron).

The Effect of Whole Tire Reclaimed Rubber on the Accelerated Aging of Natural Rubber and GR-S. Certain specifications for various kinds of industrial rubber goods call for accelerated aging tests. Inasmuch as reclaimed rubber is an important compounding ingredient for such goods, it is worth while to know what effect reclaimed rubber may have on the behavior of natural rubber and GR-S during accelerated aging.

Four commercial whole tire reclaims were used: (1) natural rubber, alkali process; (2) natural rubber, neutral process; (3) blend of natural rubber and GR-S, neutral process, and (4) GR-S, neutral process. The third is the predominating type today. Each of the four reclaims was used in two proportions with both natural rubber and GR-S, replacing 20 and 50%, respectively, of the new rubber. Control compounds containing no reclaimed rubber were included. Dumbbells cut from press cured slabs were aged 46 and 96 hours in the air oven at 100° C. and also in the oxygen bomb at 70° C., 300 p.s.i.

For maximum resistance to accelerated aging the use of reclaimed rubber with either natural ruober or GR-S may be beneficial. The beneficial effect is often pronounced. A high proportion of reclaim tends to be better for age resistance than a low proportion, and the modern whole tire reclaim containing GR-S hydrocarbon tends to be better than its prewar counterpart. J. M. Ball and R. L. Randall (Midwest Rubber Reclaiming Co., East St. Louis, Ill.).

Reclaiming of Vulcanized Rubber: Rate of Replasticization. A study of the rate of replasticization of vulcanized rubber and some synthetics under simple conditions has been made in an effort to clarify the mechanisms involved in the reclaiming of rubber. It is shown that ground vulcanized rubber heated in the temperature range of 250-400° F. undergoes a rapid initial increase in plasticity and on continued heating passes through an inversion point and rehardens until after prolonged heating a further but slower increase in plasticity is attained. When the cycle described has been completed, the normal reclaiming range of four to 14 hours or more has been reached.

Three points of equal plasticity exist in this time cycle. This behavior is characteristic for all vulcanized rubbers studied, but the exact shape and position of the resultant plasticity-time curve, and the slopes of the various sections of the curve vary with the rubber, physical conditions, and reclaiming agents used. Synthetics show a similar behavior, but the rehardening process tends to predominate so that the initial rapid dip in plasticity is less pronounced and is realized only under special conditions. The influence of temperature, plasticizing agent, type of rubber, and other factors is reported. Properties of the revulcanized product at various stages of the time cycle have been studied.

The initial replasticization of the scrap may be made to occur in a very short time under suitable temperature conditions and type and concentration of plasticizing agent. On rapid cooling at this stage the product is a stable and superior reclaim. It is thus found that reclaiming can be effected in relatively short times.

An explanation of the plasticity-time behavior is suggested, and its implications for reclaiming and utilization as the basis for improved reclaiming procedures are discussed. The probable dependence of the relative activity of chemicals as plasticizing agents depending not only on process conditions, but also on the particular stage of the time cycle, is pointed out. E. F. Sverdrup, J. S. Plumb, and J. C. Elgin (U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y.).

The Effect of Soil Microorganisms on Rubber Insulation. The service life of most rubber insulated underground cables has been excellent. A few cases of failure in control and communications cables have been caused by direct contact with soil. Such failures are characterized by discrete spots of low insulation resistance. Under laboratory conditions favoring microbial activity we have produced in a few weeks failures resembling those found in cable after 10 or more years. Parallel tests in active soil, sterilized soil, and water proved the failures were caused by microorganisms.

Insulation resistance is the most sensitive unambiguous criterion of failure of insulation in soil. It indicates microbial attack sooner than customary bacteriological methods. Insulations vary in resistance to microbial attack. GR-S and butyl compounds are stable in soils that cause rapid failure of natural rubber compounds. Other soils contain microorganisms that can attack them. Gutta percha is more resistant than natural rubber. Neoprene, polyvinyl chloride, and polyethylene to date appear completely stable.

The probable mechanism of attack is oxidation by aerobic microorganisms. They appear to cause failure in three ways: by growing directly on the rubber and consuming it; by growing on soil particles in contact with it; and by growing near it. Enzymes seem to cause the failure. Deterioration occurs beyond regions reached by microbes. All three actions are involved in attack on natural rubber. Attack on GR-S and Butyl is characterized by absence of surface colonies. Apparently the agents causing failure cannot utilize them directly as food. Conditions producing cable failure by microbial attack during reasonable service life are extremely rare. J. T. Blake and D. W. Kitchin (Simplex Wire & Cable Co., Cambridge, Mass.).

Effect of Traces of Antioxidant on the Stability of Crude GR-S. It has been frequently observed in this laboratory that different batches of crude GR-S containing no deliberately added antioxidant varied widely in stability. Some batches showed evidence of oxidation either at the end of the drying process or on aging for several weeks. In other cases, the stability of the polymer appeared to be comparable to regular GR-S containing antioxidant.

Since most of these batches had been prepared in regular plant or pilot-plant equipment normally operated with GR-S containing antioxidant, it seemed probable that small amounts of antioxidant were being introduced into the polymer during manufacture. The observed differences in behavior of different batches would then be associated with varying amounts of antioxidant present in the finished polymer.

The object of the present work was to obtain information on the stability of antioxidant-free GR-S and to determine whether traces of antioxidant have any appreciable effect on stability of the polymer toward oxygen.

The stability of crude GR-S containing traces of antioxidant has been evaluated by measurement of oxygen absorption rates and changes in physical properties of the polymer during accelerated aging. Antioxidant-free GR-S was found to be highly unstable toward oxygen. The inhibiting effect of phenyl β-naphthylamine at a concentration as low as 0.001% could be detected, but the effect did not become appreciable until the antioxidant content reached 0.1%. E. J. Glazer, C. R. Parks, J. O. Cole, and J. D. D'Ianni (Goodyear).

Compression-Set of Nitrile Rubbers as Affected by Compounding. The advent of butadiene-acrylonitrile copolymers has led to the development of compounds to resist heat and oil or heat alone to a degree heretofore impossible. This new era of compounding, however, has posed many new problems, one of which is the development of formulations that possess high resistance to compression set as well as resistance to various oils. The effects of nitrile content, pigmentation, curative systems, time and temperature of cure, processing safety of various curatives, and effect of polymer dilution with other elastomers, i.e., crude, GR-S, and reclaimed hydrocarbon, have been studied, and the results are presented as a guide to the adoption of butadiene-acrylonitrile copolymers to new compounding developments.

In addition to the above, data on the effects of air, absence of air, and low vs. high aniline point oils on set at high temperatures are presented. A study of compression set at 212, 250, and 300° F. made in stocks of 40 ± 5, 50 ± 5, and 60 ± 5 durometer levels is also presented. Further studies relative to the effects of stock tempering following cure on compression set as a means of improving initial set properties have been investigated.

Future mechanical developments in the automotive and mechanical fields offer many possibilities for the use of acrylonitrile elastomers in applications that could not possibly be met with previously available materials. C. G. Cashion (Xylos).

Infrared Studies of 1,2 and Trans-1,4 Structure of Polybutadiene and Butadiene-Styrene Copolymers Polymerized at Various Temperatures. Butadiene-styrene copolymers having superior physical properties are obtained by polymerization at temperatures of 41° F. or below. This improvement in physical properties is attributed to an increase in structural regularity of the polymer as the temperature of polymerization is lowered. In order to make a structural analysis of these polymers a quantitative method is necessary for measuring either cis or trans 1,4 content of the butadiene polymers.

1,2 and trans-1,4 addition of butadiene polymers were measured by employing infrared bands at 910 and 967 $cm.^{-1}$, respectively. 1-octene and trans 4-octene were used for calibration purposes. These methods were applied to structural investigations on polybutadiene polymerized in the temperature range —2 to +206° F. Butadiene-styrene copolymers prepared at 0, 41, and 122° F. were also studied.

Trans-1,4 addition increases and 1,2 addition decreases with decreasing temperature of polymerization in polybutadiene and butadiene-styrene copolymers. At —2° F. substantially all of the 1,4 addition product is present in the trans-1,4 form. Approximately 20% 1,2 addition exists at this temperature. It is concluded that this accounts for the major part of the non-crystallizable portion of butadiene polymers made at low temperatures. E. J. Hart and A. W. Meyer (U. S. Rubber, Passaic, N. J.).

The Structure of Neoprene. II. Determination of End-Groups by Means of Radiosulfur. Sulfur-modified polychloroprene rubber, i.e., Neoprene Type GN, has been shown by the use of radioactive sulfur

to be essentially a copolymer of chloroprene and sulfur in the approximate ratio of 100 chloroprene units per sulfur atom. The sulfur units, possibly disulfides, are cleaved by an alkaline emulsion of tetraethyl thiuram disulfide so that a gel polymer containing combined sulfur can thus be converted to a soluble, plastic product. The mechanism of this cleavage reaction has not been completely elucidated as yet.

Potassium persulfate, used as initiator for the polymerization of neoprene, appears to be combined with the polymer in Neoprene Type GN in amounts equivalent to eight to 17 polymer molecules formed for each sulfur-containing initiator fragment. When dodecyl mercaptan is used as modifier, however, a large proportion of the polymer molecules contains essentially no combined sulfur from the persulfate, and it appears that the true initiator is the RS• free radical formed by reaction of the mercaptan with potassium persulfate.

Dodecyl mercaptan, used as a polymerization modifier or chain transfer agent, is combined in a greater amount than the one mercaptan per polymer molecule expected on the basis of simple chain transfer. High molecular weight fractions contain three to four mercaptan sulfur atoms per polymer molecule, and the results suggest that mercaptan addition to the double bonds of the polymer had occurred. The implications of these results are discussed. W. E. Mochel and J. H. Peterson (E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.).

Dilatometric Measurement of Molecular Regularity in Polymers. The molecular regularity of various synthetic elastomers has been determined by measurement of the crystallizability of the raw, unstretched polymers. The relative crystallizability of the polymers was measured dilatometrically in terms of the isothermal volume decrease characteristic of the ordering process of crystallization by the use of Pyrex glass dilatometers of the type described by Bekkedahl and Wood in their study of the crystallization of natural rubber.[1]

The crystallizability of a series of polymers, varying in composition from 100% butadiene to 70-30 parts by weight of butadiene-styrene, which had been prepared in a ferricyanide-activated, diazothioether emulsion recipe at —10° C., was found to decrease regularly with increasing styrene concentration.

The molecular regularity of polybutadiene polymerized in the system described above and also in an oxidation-reduction (redox) recipe catalyzed by an iron pyrophosphate complex has been shown to be dependent on the polymerization temperature; the crystallizability of the polybutadiene increases markedly with decreasing polymerization temperature. A similar relation between polymerization temperature and molecular regularity has been found for a series of polychloroprenes polymerized in an emulsion system employing sodium rosinate, sulfur, and ammonium persulfate.

The stress-strain properties of gum compound vulcanizates of the polychloroprenes showed a striking improvement which coincided with increasing crystallizability of the polymers prepared at successively lower polymerization temperatures. V. E. Lucas, P. H. Johnson, L. B. Wakefield, B. L. Johnson (Firestone Tire & Rubber Co., Akron).

An Instrument of Determining the Relaxation and Recovery of Elastomers. An instrument has been developed which will determine the rate of relaxation of elastomers under compression or shear as well as recovery after partial or complete release of load at temperatures from —70 to 158° F. The load which is recorded on a Foxboro Dynalog is determined by means of a strain gage in a Baldwin SR-4 Type C force cell (capacity 2,000 pounds).

The sample of elastomer to be tested is placed in the machine, which is maintained at a constant temperature, and compressed to either a predetermined load or to a definite per cent. by means of a hand crank. The sample may be tested with or without previous conditioning at the test temperature.

Although MacDonald and Ushakoff[2] report that the change in rate of relaxation is uniform with log time when elastomers are tested at room temperature, the rate of relaxation both at higher and lower temperatures is not similarly uniform. For this reason the continuous recording of the load and the use of a mechanism which permits the opening and closing of the specimen clamps by an indicated one-thousandth of an inch are of great value in the study of rate of crystallization or of stiffening at low temperatures.

A preliminary investigation has indicated that below 158° F. the amount of relaxation decreases with compounded GR-S, polybutadiene, natural rubber, GR-I, and GR-M. A compound of Hycar OR-25 appeared to have fairly uniform relaxation properties over this temperature range. Data obtained from the recovery of these specimens indicated inferiority of GR-M and Hycar OR-25 when tested at —70° F. The overall picture shows GR-I to be slightly superior to the balance of the polymers as regards this characteristic. W. E. Phillips (B. F. Goodrich Co., Akron,) and B. G. Labbe (Government Laboratories, University of Akron).

[1] *Ind. Eng. Chem.*, 33, 381 (1941).
[2] *Anal. Chem.*, 20, 8, 713 (1948).

Wednesday Morning—November 10

A New Non-Discoloring Antioxidant for Natural Rubber. It is shown that a representative of the trialkylphenol group is an excellent antioxidant for natural rubber compounds containing mineral fillers or carbon black. In high-temperature aging conducted in air and in oxygen under pressure this phenol derivative has been found to compare favorably with the best commercial antioxidants. The retention of tensile strength and elongation and resistance to cut growth in the aged samples were excellent. The antioxidant is readily compatible with both natural and synthetic rubbers and has not been observed to bloom out at normal loadings of one to three PHR. This antioxidant also has little if any effect on the rate of cure of natural rubber, and no allowance need be made for it in compounding. Distinct advantages in many applications are its light stability and non-staining and non-discoloring characteristics. D. E. Winkler and F. M. McMillan (Shell Development Co., Emeryville, Calif.).

Rubber and Vinyl Dispersed Colors and Their History. The real beginning of the use of organic colors in rubber goods came with the use of organic accelerators. The quality of colors in rubber has improved over the early pigments used. Colors were developed that possessed heat and light stability and non-bleeding characteristics; however, the particle size of the pigments has been the limiting factor in their use in rubber and vinyl stocks. The preparation of a color masterbatch by the wet method prevents the agglomeration of color particles during drying and insures a fine particle size and complete color dispersion. With the development of a protective colloid compatible with all natural and synthetic rubbers and many plastics, a new type of dispersed color has been made in this manner.

One of the largest fields for dispersed colors is the vinyl film industry where emphasis is placed on the final color particle size. Dry colors cannot be used as such, but must be ground into plasticizers or dispersed, while wet, into a protective colloid that is compatible with the vinyl stock. The latter method yields a finer particle size and is more economical. With slight modifications it is possible to produce a powdered dispersed color which has far-reaching uses in vinyl film.

Theoretical explanations of the causes of the bleeding of colors in rubber and vinyl stocks is important to prevent color discoloration, fading, and bleeding. It is necessary if quality colored goods are to be produced. T. G. Sullivan, H. H. Watjen (Sinclair & Valentine Co., New York).

Emulsifier-Free Latex. Many instances can be cited where it would be advantageous to have a latex without emulsifier or a polymer coagulated therefrom. This requirement led to the development of a polymerization system wherein no emulsifier is charged to the reactor. Monomer water, potassium persulfate (catalyst), and sodium metaphosphate (stabilizer) constitute the complete recipe. The ultimate latex contains derivatives of the polymer units such as sulfates, alcohols, glycols, and sulfonic acids which lend stability. If a partially water soluble monomer such as acrylonitrile or methylmethacrylate is present, a reducing agent may be employed giving a redox-type system and resulting in very rapid reaction rates.

Particle size studies on these latices with the electron microscope have shown a very large average particle diameter. A typical value is 5600 Angstroms compared to 800-900 for GR-S. It has been shown that the particle size increases as the reaction rate decreases. The fluidity of these latices is, of course, very good. These latices are normally acid, but can be carried to a pH of above 7 by careful neutralization. Coagulated polymer from this system has shown outstanding resistance to aging. J. M. Willis (Firestone).

Factors Affecting Emulsion Stability in Blends of GR-S and *Hevea* Latices. I. The Stabilizing Power of Soap Solutions in Latex in the Presence of Inorganic Salts and Some Amino Acids. The ultimate stability of blends of soap-stabilized GR-S and *Hevea* latices will be dependent chiefly upon the degree of interaction occurring between the stabilizing media characteristic of each latex. In view of the complex molecular constitution of dilute soap solutions due to hydrolysis, the types of reactions that may take place can be quite varied. Besides the changes in stability resulting from the formation of actual chemical complexes are those variations caused by the presence of certain electrolytes common to each system.

A fundamental study has been made of the emulsion stability behavior of a purified natural latex in which the proportions of several potentially reactive ingredients representative of each stabilizing system have been systematically varied. The observed changes in stability have been explained on the basis of salt effects and the possible association of one of the soap hydrolysates employed with certain amino acids. The actual enhancement of emulsion stability resulting from the association of a stoichiometric acid soap with the amino acids has been demonstrated. K. W. Gardiner (Firestone).

The Mechanical Stability Test for *Hevea* Latex. The mechanical stability test is a rapid, simple method of estimating the colloidal stability or quality of *Hevea* latex. It is shown that the latex particles start to agglomerate as soon as the peripheral speed of the agitator reaches the minimum value required to exert sufficient shear to overcome the force of repulsion due to the charge on the particles. If a sufficiently high, constant shear is applied, progressive flocculation continues during the test until mechanical coagulation occurs. The "end point" is defined as the time in seconds required to coagulate 0.5 to 1% of the total solids in the sample.

Tests indicated that most of the shear or rub on the latex takes place at the outer edge of the agitator. A flat disk is recommended as a standard in place of the Benedict ring-type agitator formerly employed in similar apparatus. This shear depends upon peripheral speed which varies directly with shaft speed and the diameter of the agitator. Mechanical stability is shown to depend critically on the size of sample, the total solids, and the temperature. Lowering the temperature of the latex from room temperature to 10 or 5° C. increases the mechanical stability very markedly. Equipment and procedure for the test are described in detail.

Less significant factors are size and shape of sample bottle, ammonia concentration in sample, and atmosphere in which test is run. A high-shear, low-speed stability test was also studied. H. G. Dawson (Firestone).

A Comparison of the Vulcanization Characteristics of 2-Thiazolethiol and Its Disulfide with Other Thiazole Accelerators. For many years the mercaptothiazole class of accelerators has been the most widely used vulcanization accelerators in the rubber industry. Even though considerable interest has been evinced as to the efficacy of the simplest members of this series, the synthesis of 2-mercaptothiazole has only very recently been reported, first in a patent issued to The B. F. Goodrich Co. in 1947 and subsequently in a paper by the authors together with the synthesis of its disulfide.

This compounding study was made to compare the vulcanization characteristics of 2-mercaptothiazole and 2,2′-dithiodithiazole with a number of commercial accelerators of the mercaptothiazole class. Equal concentrations by weight of the accelerators have been used in tread-type stocks of natural rubber and GR-S.

The following tests were performed for comparison: tensile strength, modulus, elongation, Mooney cure, hysteresis, permanent set, aging, rebound, and hardness. This study shows that the behavior of 2-thiazolethiol is similar to other mercaptothiazole controls. The rate of cure is in the same general range, but the scorch tendency, indicated by the Mooney cure, is greater. The values for hysteresis and permanent set are higher.

Stocks vulcanized with 2-thiazolethiol compare closely with the control accelerators in aging, rebound, and hardness. In comparison with the dithiazyldisulfides employed as controls, 2,2′-dithiodithiazole follows in general the pattern outlined for 2-thiazolethiol. The activity of the disulfide is similar to the control accelerators, but its delayed action effect is not so great. The hysteresis is higher in natural rubber, but in GR-S the value falls between the controls. A. J. Beber and R. A. Mathes (B. F. Goodrich Research Center, Brecksville, O.).

GR-S and Natural Rubber with Improved Processing Qualities. During the past few years considerable improvement has been made in the processing characteristics and quality of GR-S. Some of the newer types of GR-S, and particularly the GR-S made at 41° F., still present problems in processing. Natural rubber continues to require plasticization in some way to facilitate the manufacture of many rubber products.

In a previous paper one of the authors discussed, in considerable detail, the action, in dry GR-S and in dry natural rubber of o,o′-dibenzamidodiphenyldisulfide or 2,2′-dithiobisbenzanilide, now known as Pepton *22*. The results of some experiments in adding Pepton *22* to GR-S latex and to natural rubber latex prior to coagulation are now presented. This catalytic plasticizer may be dispersed in water and added to GR-S latex and to natural rubber latex prior to coagulation and thereby obtain washed and dried polymers which can be readily plasticized by hot mastication. Since most of the factory size masticating equipment gives only hot mastication, particularly with the new types of GR-S, only comparisons of hot mastication of the GR-S with and without Pepton *22* are shown.

GR-S-X-435 type (made at 41° F.) plasticized by Pepton *22* appears to require less accelerator than when no Pepton *22* is used with the same hot mastication. However, when properly cured, the GR-S-X-435 containing the catalytic plasticizer gives evidence of improved cut growth resistance after aging.

Natural rubber may be prepared at the plantation with the desired amount of Pepton *22*, shipped, and stored with no evidence of softening until subjected to hot mastication. Arnold R. Davis, Arthur C. Lindaw, Ralph A. Naylor (American Cyanamid Co., Stamford, Conn.).

Hear Sperberg and Popp

APPROXIMATELY 140 members and guests of the Chicago Rubber Group attended the first meeting of the current season on September 24 at the Morrison Hotel, Chicago, Ill. The meeting consisted of an afternoon technical session and social hour, followed by dinner and the showing of "Packsacks and Paddles," a sound-color film by Grant Halladay, naturalist and photographer.

The technical session featured two speakers from Phillips Petroleum Co. L. R. Sperberg spoke on "Low-Temperature Rubber in Mechanical Goods Applications," and George Popp discussed "Processing and Compounding Applications of HMF Black." The complete text of Mr. Sperberg's paper appears in the article section of this issue.

Mr. Popp stated that the following advantages can be obtained by using Philblack A: (1) removal of nerve of the polymer when Philblack A is added before the softeners; (2) increase in tubing speed; (3) production of smoother tubed stock; (4) production of cured stock having low moisture absorption and high thermal conductivity; (5) faster cures; and (6) savings in accelerator and sulfur compounding quantities. Additional reasons for using HMF black are the higher modulus and good hot tear resistance obtained, both factors of great importance in tire production. Philblack A is also an important factor in compounding special mechanical goods products requiring high resilience and good abrasion resistance. Mr. Popp emphasized the desirability of obtaining good sulfur dispersion when using Philblack A.

Group Chairman Robert C. Dale, Inland Rubber Corp., announced that regular meetings of the Group will be held on October 29, February 4, March 25, and May 20, and the annual Christmas Party is scheduled for December 17.

CCDA Meets

THE Commercial Chemical Development Association held a well-attended meeting October 5 at Mellon Institute, Pittsburgh, Pa. After introductory remarks by President Lauren B. Hitchcock, Quaker Oats Co., and an address of welcome by E. R. Weidlein, director of the Institute, the technical program began with a paper on "The Story of Plaskon" by M. H. Bigelow, technical service director, Plaskon Division, Libbey-Owens-Ford Glass Co. A. E. Boss, manager of pigment sales, Columbia Chemical Division, Pittsburgh Plate Glass Co., then spoke on "Adaptability—A Tool for Production Development." Dr. Boss discussed some of the requirements necessary for a non-carbon rubber reinforcing agent, such as particle size and shape, specific gravity, color, dispersability, wettability, and effect on cure, and traced his company's development of three such pigments.

Luncheon at the University Club was followed by a talk on "Educational Training for Chemical Development" by W. N. Jones, Carnegie Institute of Technology. The afternoon technical session began with a paper on "Which Develops First, the Chemical or the Market?" by H. B. McClure, vice president, Carbide & Carbon Chemicals Corp. Using examples from actual experience, Dr. McClure discussed chemical market development along the two general paths: (1) the discovery of a new chemical and its manufacturing process and the need of a market; and (2) the realization of the need of a chemical to perform a definite function, but with no such chemical as yet developed. The closing paper, "Calgon—A Chemical Development from a Non-Chemical Background," was given by E. P. Partridge and C. R. Texter, both of Calgon, Inc. The meeting also included inspection trips through Mellon Institute, the University of Pittsburgh's "Cathedral of Learning," and the Heinz Chapel, and a social hour and buffet dinner at the Hotel Schenley.

Sperberg at Ontario Group

APPROXIMATELY 80 members and guests of the Ontario Rubber Section, C.I.C., attended a dinner-meeting on October 5 at the University of Toronto, Toronto, Ont. Featured speaker at the meeting was L. R. Sperberg, Phillips Petroleum Co., who discussed "Carbon Black Reinforcement in 41° F. Low-Temperature Rubber." Mr. Sperberg's talk was identical with that which he gave at the October 1 meeting of the Detroit Rubber & Plastics Group and reported elsewhere in this issue. The Section next will meet some time in December in conjunction with the Wellington-Waterloo Section, C.I.C., when H. W. Watson, Polymer Corp., will speak on "Synthetic Latices, Their Production and Use."

Silicones Discussed by Wiard

THE Los Angeles Rubber Group, Inc., held a meeting at the Hotel Mayfair, Los Angeles, Calif., on October 5 which was attended by 190 members and guests. Technical Chairman George W. Miller, W. J. Voit Rubber Corp., presided over the afternoon technical session, which featured a talk by William Wiard, Dow Corning Corp., on "Silicones—New Engineering Materials for the Rubber Industry."

Mr. Wiard began his talk with a brief review of the history of silicone materials, the background of Dow Corning, and the present methods of silicone manufacture. The four general groups of commercial silicones were covered with respect to chemical and physical properties. The speaker described the fluids and emulsion used in the rubber industry and a new technique, now under development, involving the application of one of the fluids to the outside of uncured tire casings. Advantages of the silicones in the rubber industry include elimination of dusting powders, improved appearance of product, and longer mold life between cleanings.

After some discussion of silicone electric motor insulation, industrial greases, and resin pan coatings for the baking industry, Mr. Wiard gave detailed information on the properties of Silastic silicone rubber. Its outstanding resistance to heat and cold was demonstrated by trying a series of knots in an extruded ribbon of Silastic, one end of which had been cooled to —100° F. and the other end heated to above 50° F. Methods of fabricating Silastic were also discussed and some mention was made of commercial and military uses.

At the business session, committee reports were given, and Curtis R. Wolter, Witco Chemical Co., chairman of the nominating committee, announced the following nominees for officers of the Group for the coming year: chairman, C. H. Churchill, Sterling Rubber Products Co.; associate chairman, E. C. McLaughlin, H. M. Royal, Inc.; vice chairman, R. D. Abbott, consultant, and G. R. Steinbach, Atlas Sponge Rubber Co.; secretary, Tway Andrews, H. M. Royal, Inc., and A. J. Hawkins, Jr., E. I. du Pont de Nemours & Co., Inc.; treasurer, L. E. Budnick, Ohio Rubber Co., and R. A. Lees, American Anode, Inc.; and directors, C. S. Hoglund, Goodyear Tire & Rubber Co.; F. C. Johnston, Caram Mfg. Co.; Herman Libkind, Western Insulated Wire Co.; D. C. Maddy, Harwick Standard Chemical Co.; G. W. Miller; J. R. Morath, Naugatuck Chemical Division of United States Rubber Co.; M. L. Paine, Firestone Tire & Rubber Co.; W. E. Shawger, California Rubber Products, Inc.; and R. L. Short, Kirkhill Rubber Co.

The evening dinner-meeting, sponsored by Firestone, was presided over by Vice Chairman McLaughlin in the absence of Chairman P. W. Drew, Goodyear, and Associated Chairman Churchill. Special guests from the Firestone plant were introduced by Clyde Smith, factory manager, and included H. J. Bensinger, R. E. Hutchinson, H. H. Wiedemann, R. W. Davis, and L. K. Firestone, company president. Entertainment was provided during the dinner, which was followed by a talk on "Military Application of Jet Propulsion" by Col. B. S. Mesick, in charge of Army research and development of solid fuel rockets at the California Institute of Technology.

Colonel Mesick gave a very interesting explanation of the operation of rockets. Jet propulsion is not new, he said, but is the simplest form of heat engine and is developed from Newton's third law. In essence, part of the burned gases go in one direction, while the rocket and the balance of the gases go in the opposite direction. Rocket motors have a thermal efficiency of 60%, the turbo-jet efficiency is 65%, and the ram jet has a 90% efficiency, while the automobile motor has only a 25% efficiency.

Door and other prizes donated by Firestone were won by the following: set of dishes, S. M. Dobbs, Dobbs-Waket Rubber Products Mfg. Co.; Firestone tire, F. L. Beiter, Golden West Rubber Co.; waffle iron, B. A. Gruver, L. A. Standard Rubber, Inc.; electric clock, Gaines Hon, California Rubber; car cooler, B. E. Biheller, H. Muehlstein & Co.; camp stove, Mark Hartung, guest; and consolation prize, consisting of a pair of his own old shoes, F. P. Hartung.

Golf Tournament

The Group's golf competition for this year ended with a tournament on October 8 at the Hacienda Country Club, La-Habra Heights. Five hours of golfing ended with the following winners: low total putts, A. L. Pickard, Braun Corp.; low gross, W. S. Johnson, duPont; high gross, Fred Woerner, Reeves Rubber Co.; best approach shot, W. B. Higbee, Southwestern Rubber Co.; longest drive, C. M. Reinke, Reinke & Amende; blind bogey, Mr. Andrews; low net, A. P. Stiller, Fullerton Mfg. Co.; longest drive with putter, L. E. Parks, Sharples Chemicals, Inc.; and highest score on blind hole, F. J. Keefe, also of Southwestern.

Low-Temperature Rubber

ONE of the best sessions in the history of the Detroit Rubber & Plastics Group, Inc., took place on October 1 when 155 members and guests heard L. R. Sperberg, Phillips Petroleum Co., speak on "Carbon Black in Low-Temperature Chemical Rubber." The program of the meeting, held in the Detroit Leland Hotel, Detroit, Mich., consisted of a dinner, Mr. Sperberg's talk, and a meeting of local arrangements committee chairmen to discuss plans for the gathering of the Division of Rubber Chemistry, A. C. S., in Detroit on November 8 to 10.

The greatest advance in rubber technology during the past three years has been the development and adaption to practice of low-temperature chemical rubber and the companion development of the high abrasion furnace-type carbon black, Mr. Sperberg said. The first large-scale pilot-plant production of this rubber was done by Phillips, which produced and tested various butadiene-styrene copolymers prepared by emulsions polymerization at temperatures as low as 0° F. While the performance of various low-temperature rubber has been outstanding, it has been recognized, the speaker declared, that the improvement in performance charactertistics has been influenced to varying degrees by the type of reinforcement pigment employed during compounding.

The various major classes of carbon blacks have been investigated in Philprene A low-temperature rubber and compared to similarly loaded black compounds made from standard GR-S and natural smoked sheet. Mr. Sperberg stated that the data show Philprene A to possess a high degree of reinforcement at low loadings of reinforcing blacks and at normal loadings of the fine thermal and semi-reinforcing blacks. Mixing studies show the low-temperature rubber to incorporate carbon blacks more readily than does conventional GR-S or natural rubber. The HMF and HAF blacks incorporate more readily than the channel types and give compounds possessing superior processing characteristics.

The speaker stated that road tests on the various elastomer-carbon black compositions reveal that Philprene A reinforced with HAF black is substantially better in abrasion resistance than top-quality natural rubber-channel black tread compounds, while still maintaining excellent resistance to cut and crack growth. Various other Philprene rubbers exhibit the same high reinforcement potential when compounded with HAF black, Mr. Sperberg concluded.

The Group's next meeting, the annual Christmas Party, will be held December 10 at the Detroit Leland Hotel.

Rubber & Plastics Division to Meet

THE Rubber & Plastics Division of the American Society of Mechanical Engineers will hold two technical sessions on November 30 at the Hotel Pennsylvania, New York, N. Y., as part of the annual meeting of the Society to be held November 28 through December 3. J. F. Downie Smith, Dean of Engineering, Iowa State College, is chairman of the Division, and D. H. Cornell, B. F. Goodrich Research Center, is secretary.

The first session, which will begin at 9:30 a.m. on November 30, has the following papers scheduled for presentation:

Soft Rubber Bearings—Design Features and Methods of Application under Conditions of Water Lubrication. A. Bednar, Lucian Q. Moffitt, Inc., Akron, O.

Report on Friction Test on Flow Control of Continuous Film of Rubber Bearings. J. W. Stanley, E. J. Willis Co., New York.

Nylon as a Bearing Material. D. B. Hanson, E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.

At the second session at 2:30 p.m. on the same day four additional papers are to be heard:

Frictional Characteristics of O-Rings with a Typical Hydraulic Fluid. L. E. Cheyney, W. J. Mueller, R. E. Duval, Battelle Memorial Institute, Columbus, O.

Laboratory Testing of Rubber Bearings. J. R. Beatty and D. H. Cornell, Goodrich Research Center, Brecksville, O.

Advances in Rubber during 1948. Lois W. Brock, G. H. Swart, and E. V. Osberg, General Tire & Rubber Co., Akron.

Advances in Plastics during 1948. E. L. Kropscott, Dow Chemical Co., Midland, Mich.

Gates Club Hears Christensen

THE Gates Technical Club held a dinner meeting on September 23 at the Edelweiss Cafe, Denver, Colo. Approximately 83 members and guests of the club heard Leo M. Christensen, vice president of Gateway Co., speak on "Chemurgy." Dr. Christensen reviewed recent developments in chemurgy and stressed the opportunities for the chemurgic industry in the West.

Tuley, Donahue Address New York Rubber Group

THE fall meeting of the New York Rubber Group was held October 15 in the Henry Hudson Hotel, New York, N. Y. Approximately 325 members and guests attended the meeting, which consisted of an afternoon technical session, followed by a cocktail hour, dinner, and entertainment. Two talks were presented during the technical session: William F. Tuley, operations manager on synthetic rubber and rubber chemicals for Naugatuck Chemical Division of United States Rubber Co., spoke on "GR-S Achieves Major Advance in Performance"; and William T. Donahue, Addison-Semmes Corp., discussed "Palletizing of Raw Materials for the Rubber Industry."

Dr. Tuley stated that we are now accomplishing on a large commercial scale the first major advance in GR-S quality since the production of butadiene-styrene chemical rubber was established in this country in 1942. He mentioned that during the year or two following the war considerable pessimism existed among rubber technologists and the rubber industry in general as to the practical possibility of materially improving the quality of GR-S and maintaining a cost which would be competitive with natural rubber.

In respect to quality, the outlook is now more optimistic for the competitive position of butadiene-styrene chemical rubber. GR-S polymerized at temperatures near or below freezing has now been in limited commercial use in tires for several months. Tire manufacturers generally agree that the low-temperature GR-S with the most favorable compounding gives an increase in tread mileage of passenger tires of about 30% over the best natural rubber treads. Under some driving conditions the improvement is much more than 30%, it was added.

The tire manufacturers have now taken positive positions on their future minimum consumption of GR-S made at 41° F., and on this basis the Reconstruction Finance Corp. has approved the conversion of 183,000 long tons of the present operating capacity to produce GR-S at 41° F. instead of 122° F. Although this conversion is based on stated needs of tire manufacturers, the production will be available for distribution to manufacturers of all rubber products, and it was emphasized that manufacturers of non-transportation products using GR-S on a voluntary basis should determine the merits of low-temperature GR-S in their products and make their requirements known so that adequate capacity will be provided.

Low-temperature GR-S was compared with standard GR-S and natural rubber on the basis of improvements in tensile strength, abrasion resistance, flex-cracking and cut-growth, and processing. It was mentioned that processing was more difficult with VFF and EPC blacks, but that improvements could be expected. Properties that have not been improved in low-temperature GR-S are tensile strength of non-black compounds, hysteresis and heat build-up, stiffening at low temperatures, atmospheric cracking, and tackiness of raw stocks.

Dr. Tuley then discussed the effects of low-temperature polymerization on the composition of the polymer. More regular structure, more like natural rubber, results for low-temperature polymerization of butadiene and styrene. An increase in the amount of 1,4 addition and trans-configuration is evidenced, and at 0° F. the cis structure is practically eliminated.

Polymerization at sub-freezing temperatures further improves the properties of GR-S, and the magnitude of the increase in quality must be weighed against the estimated increased cost, it was said. Only a very slight increase in cost results from the manufacture of GR-S at the temperature of 41° F.

In conclusion, it was predicted that low-temperature GR-S will displace standard GR-S as rapidly as the former is made available; low-temperature GR-S will be preferred on a quality basis in a substantial volume over natural rubber even though the latter sells at a somewhat lower price; demand for low-temperature GR-S will probably exceed supply for the next 12 to 18 months and will probably not be adequate until almost all of the GR-S production facilities have been converted; low-temperature GR-S in the near future will not increase the total consumption of GR-S above the present level at the expense of natural rubber; and consumers of rubber products will benefit from better performance through the use of low-temperature GR-S.

Mr. Donahue began his talk with a review of the advantages, both in handling and costs, of pallets and palletizing and gave a history of the development and expansion of this method of handling materials in shipment and storage. The newest development in the field of palletizing is the use of expendable cardboard pallets, engineered to fit the material being handled, which provide additional savings in cost. Application of these expendable pallets to different types of materials is now in progress, and the speaker described the test work being performed on the use of these pallets for shipping metal and machine parts, empty paper cartons, carbon blacks packed in bags, and other products. Mr. Donahue detailed the trial carload shipments of bagged carbon black, with the bags attached to the expendable pallets by means of metal straps, and discussed the various modifications in handling found necessary to obtain the results to date which indicate the suitability and economy of this method of shipping and storing carbon black. The talk was illustrated with slides, including several on the use of expendable pallets for handling rubber parts and carbon black.

History of Latex Discussed

"LATEX: Its History, Its Development during the War, and Its Future" was the subject of the fall meeting of the Buffalo Rubber Group on September 21 at the Westbrook Hotel, Buffalo, N. Y. The meeting was the first to consist of an afternoon technical session, followed by a social hour and evening dinner, and the new arrangement was approved by the attendance, numbering 52 members and guests.

Speakers at the technical session were H. B. Townsend, vice president in charge of laboratories, and T. G. Cook, chief chemist, both of General Latex & Chemical Corp. Mr. Townsend's talk covered the history of latex from the late Eighteenth Century up to Pearl Harbor. He recounted the early investigations of latex, its disuse, and the return to latex applications after 1900. After a brief review of the chemistry of latex, including methods of preservation, concentration, and the properties of latices, the speaker pointed out that fatty acid additives are now proposed and being used as latex concentrating aids. These materials are being recorded as rubber hydrocarbon owing to the inaccuracy of the dry rubber content analytical method used at present. A mechanism for correcting this method to include an alcohol extract of the coagulum and deductions from the DRC as determined has been proposed. Mr. Townsend also reviewed general methods of compounding latex and techniques of vulcanization, including suggestions regarding inhibiting the coagulating action of zinc oxides.

Mr. Cook's talk was devoted mainly to the influence of synthetics on the latex industry, reviewing the beginnings of synthetic latex from the early German work, and the introduction here of neoprene latex, down through the last war period. After a short résumé of the principal types of synthetic latices currently available, the speaker pointed out that we are now beginning to have free competition between natural and synthetic latices. Statistics show that the increase in natural latex consumption this year over last is not at the expense of synthetics. Although natural latex has the most desirable properties for a majority of latex applications, there are many cases where natural latex is definitely less desirable than one or more synthetics. In still other cases GR-S latex is being used in whole or in part because it is cheaper, Mr. Cook declared. The conjecture was made that in the long run the percentage of synthetic latex used will increase if for no other reason than that new and better types will be produced, and the speaker concluded by giving some of the reasons why latex is often the preferred form of rubber to use in various applications.

Both talks were illustrated with samples of latex products, most of which were produced in the Buffalo area, and followed by a question and answer period with a panel of latex experts arranged for by Burt W. Wetherbee, Wetherbee Chemical Co. C. C. Furnois, director of the Cornell Aeronautical Laboratory, Cornell University, was after-dinner speaker. Dr. Furnois described the work and status of the laboratory and told of the activities of the technical societies in western New York in recommending technical personnel for appointment to various state and local boards.

"Vistac in Rubber"

Approximately 37 members and guests attended the October 19 meeting of the Buffalo Group, in the Hotel Westbrook, which featured a talk on "Vistac in Rubber" by Henry P. Pryor, Advance Solvents & Chemical Corp. This began with a review of the composition and properties of the Vistac series of low molecular weight polybutenes, of which Vistacs #1, #2, and #4 are the chief members. The speaker pointed out that the Vistacs are saturated, resistant to oxidation and aging, non-vulcanizable, tacky, non-toxic, straw-colored, non-staining, and soluble in chlorinated solvents, lubricating oils, and practically all petroleum and coal-tar hydrocarbons.

Slides which illustrated the effect of Vistac on natural rubber and GR-S were shown, and the effects of the materials on Butyl, neoprene, and nitrile rubbers were also discussed. After a display and a discussion of various rubber products and the solution of problems in which Vistacs played a vital role, the speaker emphasized the versatility of the materials by a review of its present and potential uses in

a wide range of applications. The extreme resistance of Vistacs to water vapor, gas, and alkalies, its adhesive properties, ability to flow at low temperatures, and non-toxic features are among the few of the properties spurring new thought and usage, such as the recent development of Vistac-resin blends for the paint industry.

Following dinner, talks on the customs and immigration services were given by F. Quigley, United States Customs Service, and A. Carnuth, United States Immigration Service, respectively. The Group will hold its annual Christmas Party and election of officers on December 14 at the Westbrook Hotel.

Chemical Exposition at Chicago

"THINGS to Come" was the theme of the fifth National Chemical Exposition, sponsored by the Chicago Section of the American Chemical Society and held in the Chicago Coliseum, Chicago, Ill., on October 12-16. More than 30,000 registrants from every state in the union and several foreign countries attended the exposition, by far the largest ever held in Chicago. More than 200 industrial firms were represented in the main exhibition; some 75 individual chemists took part in the Chemical Trail Blazers Exhibits, and there were special feature exhibits by the four regional laboratories of the United States Department of Agriculture, the Special Libraries Association, John Crear Library, and the Armed Services Quartermaster Food & Container Institute. A special feature was the Industrial Chemical Conference held in conjunction with the exposition. The conference included panel discussions on chemical market development, chemistry in general industry, chemical hazards, industrial research management, frontiers of chemistry, and pilot-plant use by the chemical industry.

Among the exhibits of interest to the rubber and plastics industries were those of American Cyanamid Co., which featured rubber chemicals, and the plastics and chemicals shown by Dow Chemical Co. Besides displays of Bakelite and Vinylite, Carbide & Carbon Chemicals Co. showed its various plasticizers for rubber and plastics. Standard Oil Co. (Indiana) featured nonyl alcohol, a new material expected to form the base for many new ester plasticizers, and a line of petroleum base plasticizers. Other petroleum derived plasticizers were displayed by Socony-Vacuum Oil Co., Oronite Chemical Co., and L. Sonneborn Sons, Inc.; while displays of ester-type plasticizers were featured by Armour & Co., Commercial Solvents Corp., Emery Industries, Inc., and Glyco Products, Inc. Cumene hydroperoxide, a catalyst for the manufacture of low-temperature rubber, and Rosin Amine D, a softener and reclaiming agent, were shown by Hercules Powder Co. Among the equipment displays were those of special-purpose rubber gloves by Pioneer Rubber Co.; plant safety equipment by Mine Safety Appliances Co.; plastics for chemical processing operations by Haveg Corp.; and Tygon lined processing equipment by U. S. Stoneware Co.

Of interest in the Chemical Trail Blazers Exhibits were the display on the use of vinyl polymer latices in protective coatings by L. E. Ludwig, of Montgomery Ward Paint Works, and the exhibit on beta-propiolactone by L. R. Modlin, Jr., B. F. Goodrich Chemical Co.

Additional Experimental GR-S Polymers and Latices

ADDITIONS to the list of experimental GR-S dry polymers and GR-S latices, available for distribution to rubber goods manufacturers under the conditions outlined in our November, 1945 issue, page 237, appear in the table which is printed below.

Normally, experimental polymers will be produced only at the request of the consumers, and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside, if possible, for distribution to other interested companies for their evaluation. The 20 bales, when available, will be distributed in quantities of one bale or two bales upon request to the Sales Division of Rubber Reserve, or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received.

X-Number Designation	Manufacturing Plant	Date of Authorization	Polymer Description
X-480-GR-S	General, Baytown	8-20-48	A mixture containing 75±3 parts HMF black and 100 parts GR-S. Stabilized with 1.5% PBNA. Mooney equivalent to 40±4 on the finished unpigmented polymer.
X-481-GR-S	U. S. Rubber, Borger	9-3-48	Copolymer of 71 butadiene, 29 styrene charge ratio; made at 41° F., DDM modifier. Cumene hydroperoxide activated recipe with rosin soap. Shortstopped with ditertiary butyl hydroquinone. Stabilized with 1.25% PBNA. Mooney, 60±5.
X-482-GR-S	Goodyear, Torrance	9-9-48	Copolymer of 72 butadiene, 28 styrene charge ratio; made at 41° F. Cumene hydroperoxide activated recipe with rosin soap. Shortstopped with dinitro chlorobenzene. Antioxidant, 1.25% BLE. Mooney, 60±5.
X-483-GR-S	Goodyear, Torrance	9-9-48	Same as X-482-GR-S except that Mooney is 50±5.
X-484-GR-S	Goodyear, Houston	9-8-48	Same as GR-S produced continuously except 4.0 parts soap and slightly lower conversion.
X-485-GR-S	Copolymer, Baton Rouge	7-23-48	Copolymer of 71 butadiene, 29 styrene charge ratio; made at 41° F. Cumene hydroperoxide activated recipe. Shortstopped with dinitrochlorobenzene. Mooney, 60±5.
X-486-GR-S	General, Baytown	9-16-48	A mixture containing 50±2 parts reinforcing furnace black and 100 parts GR-S. Stabilized with 1.5% PBNA. Mooney equivalent to 45±4 on the finished unpigmented polymer.
X-487-GR-S	Goodyear, Houston	9-9-48	Regular GR-S except stabilized with 1.5% R-2015.
X-488-GR-S	U. S. Rubber, Borger	9-29-48	Copolymer of 72 butadiene, 28 styrene charge ratio; made at 41° F. Cumene hydroperoxide activated recipe with Dresinate 214. Shortstopped with ditertiary butyl hydroquinone. Antioxidant, 1.25% BLE. Mooney, 60±5.
X-489-SP-GR-S	U. S. Rubber, Naugatuck	9-24-48	A copolymer of 95 butadiene, 5 styrene charge ratio; made at 122° F. 43 parts Dresinate 731. 1.25% BLE antioxidant. Mooney, 55±5.
X-490-GR-S	U. S. Rubber, Borger	9-30-48	A mixture of 50 parts Philblack 0 and 100 parts low-temperature polymerized GR-S. (Cumene hydroperoxide activated recipe made at 41° F., DDM modifier. Shortstopped with ditertiary butyl hydroquinone. Antioxidant, 1.5% BLE. Mooney, 38±4 on the unpigmented polymer.)
X-491-GR-S	Firestone, Akron	9-29-48	Copolymer of 55 butadiene, 45 styrene charge ratio; made at 150° F. with 6.3 parts K wood rosin soap and 0.7-part Resin 731 soap. Antioxidant, 0.5 parts Stalite. Salt-alum coagulation. Mooney, 50-75. Maximum volatile matter, 0.75%.
X-492-GR-S	Goodyear, Torrance	10-4-48	Copolymer of 72 butadiene, 28 styrene charge ratio; made at 41° F. Cumene hydroperoxide activated recipe; 4.0 parts potash ORR soap. Shortstopped with dinitrochlorobenzene. Antioxidant, 1.25% BLE. Mooney, 55±5. Slightly lower conversion.
X-493-GR-S	Goodyear, Houston	9-29-48	Regular GR-S except shortstopped with hydroquinone and stabilized with 1.5 parts R-20190. Mooney, 60±5.

Labor Relations Discussed at Akron Group Meeting

APPROXIMATELY 300 members and guests of the Akron Rubber Group attended the fall meeting on October 15, at the Mayflower Hotel, Akron, O. Feature of the program was a talk on "The Trend in Labor Relations" by Frank Rising, general manager of Automotive & Aviation Parts Manufacturers, Inc., an association that includes 400 manufacturers in 30 states.

Mr. Rising predicted that, regardless of the outcome of the national elections, the United States will see more strikes in 1949 than at any time in the past three years. He based this prediction on the belief that fourth-round wage increases will be difficult to get and will lead to a "get tough" policy on the part of the unions. Mr. Rising also decried the bitterness which, he said, has crept into the labor movement in the past few years, and the efforts which have been made to create and emphasize class lines.

Chairman Henry F. Palmer, rubber consultant, announced that the Group's winter meeting, on February 18 at the Mayflower Hotel, during the afternoon technical session will feature a symposium on industrial fabrics. This session will be followed by a dinner and a talk by L. F. Livingston, manager of public relations for E. I. du Pont de Nemours & Co., Inc.

RUBBER WORLD
NEWS of the MONTH

Highlights—

The rubber goods manufacturing industry seems to be maintaining a monthly sales level of more than $300 million a month, according to latest reports from the United States Department of Commerce. Some softening of demand for tires has been indicated, but even heavier demand for mechanical goods items has developed. Much of the latter, however, seems to stem from requirements for the European Recovery Program. The government's price fixing complaint against several major tire producing firms has resulted in a *nolo contendere* plea by the defendants and the imposition of fines totaling $50,000. World natural and synthetic rubber production seems to have run ahead of consumption during the last few months in spite of the tremendous production rate of the fabricating industry.

Slackening Demand for Tires Noted; Natural Rubber Production Still Higher Than Demand

The first indications of a drop in the demand for bus and truck tires has been reported, while at the same time the consumption of passenger-car tires appears less than a few months ago. The level of consumption of both types of tires, however, is far above prewar. At the same time manufacturers of hose and belting report an increase in their backlogs of orders for such products.

Fines totaling $50,000 were levied against the Rubber Manufacturers Association, Inc., and several major tire producing companies as a result of the United States Department of Justice price fixing suit instituted in August, 1947, in New York Federal Court. The National Association of Independent Tire Dealers has meanwhile started a separate suit to recover over $4 million in damages against the RMA and some of its members as a result of the alleged price fixing conspiracy.

World production of natural rubber for the first eight months of 1948 is 170,000 long tons greater than for a comparable period in 1947. Stocks at the end of August, 1948, are 26,000 tons higher than at the end of 1947. For the same period synthetic rubber world stocks increased 32,500 tons.

Industry Outlook and Trends

The first indications of a buyers' market in truck tires have appeared; while a slowdown of passenger-car tire consumption indicates the approach of intense competition in that field, John L. Collyer, president of The B. F. Goodrich Co., stated late in September. This approaching buyers' market will only be in relation to postwar sales peaks, he added.

Rubber consumption in the United States in 1949 may decline to 950,000 long tons from the 1948 consumption estimate of 1,050,000 tons, as a result, Mr. Collyer also said.

E. J. Thomas, president of the Goodyear Tire & Rubber Co., told executives attending the company's fiftieth anniversary celebration in Akron, O., that an increased rate of productivity and labor is the only way America can support its world and domestic obligations while maintaining or bettering its standard of living.

The average annual gain of 3.5% in productivity prior to 1941 has not been maintained since the war, he said. Instead, we have actually had decreases. In addition, every governmental brake of regimentation and control must be removed to realize the full utilization of our productive effort, he concluded.

According to a report credited to "officials of two large manufacturers," backlogs have started to increase for larger size of inquiries indicating that a long and other mechanical rubber goods. Much of the increased demand is a result of European Recovery Plan requirements now coming through from European agents in larger volume. Further increases in backlogs during the fourth quarter of 1948 are indicated by the growing volume and size of inquiries indicating that a long-term era of materials handling mechanization is developing, it was said.

Orders being received are firm commitments because large belts are usually made to order for specific installations. Present trends indicate that much of the business is the result of large engineering research surveys of materials handling costs.

New types of belts introduced by several companies during the past two years now permit heavier belt loading, lower repair and maintenance costs, steeper inclines, longer flights, and more rapid discharge. These advantages coupled with longer belt life have vastly expanded the fields of application of underground, outdoor and indoor types of belts, it was said.

William O'Neil, president, The General Tire & Rubber Co., in a statement in mid-October took the position that new high sales levels are a characteristic of, and not something rare in the rubber industry. The peak sales level definitely is a thing of the future, he said. "Horizons unlimited" best defines the outlook for this industry, which is expected to set up a new production record this year.

The ever-increasing use of trucks for freight movement is one of the vital reasons contributing greatly to the current demand for rubber products. While trucks now haul only a small percentage of the nation's three-billion-ton freight shipments, their steadily decreasing operation costs through longer mileage tires and better equipment cannot help but bring them more and more hauling in the future, Mr. O'Neil declared. Increased truck transportation means greater demands for tires.

Harvey S. Firestone, Jr., chairman of the board, Firestone Tire & Rubber Co., urged American businessmen to become more active in emphasing the merits of competitive free enterprise both at home and abroad in a talk before the American Trucking Associations in Washington, D. C., on October 10.

Mr. Firestone attacked two major fallacies upon which, he said, many of the objections to the American system of competitive free enterprise were based. The first of these, he asserted, is the idea that workers get the smallest share of the income from manufacturing and that the owners receiver fabulous amounts. Actually, about 85¢ out of every dollar of sales by manufacturers go for salaries and wages; while only 3¢ go to the owners. These owners are the 14 million persons who directly own shares in American industry, and indirectly the 54 million who have life insurance policies and 50 million who have savings accounts. The second fallacy, Mr. Firestone said, is the belief that machinery is taking work away from wage earners; while the truth of the matter is that mass production by machinery has resulted in multiplication of both output and employment and a lowering of prices paid by consumers.

Fines Levied in Tire Suit

In early October it was announced that trial of the anti-trust suit brought against the RMA and eight major tire producers in August, 1947, by the Department of Justice would take place in the U. S. Court in New York in February, 1949. On October 21, however, it was revealed that fines totaling $50,000 were imposed by Federal Judge John C. Knox on the RMA, two of its officers, and eight corporate members after their plea of *nolo contendere* to a criminal information charging violation of the Sherman Anti-Trust Act.

The defendants were charged in the information, filed in March, 1947, with conspiring to agree on prices, discounts, allowances, bonuses, and other related practices for the purpose of eliminating competition in the sale and distribution of tires.

Judge Knox imposed a fine of $50,000 on the Association and $2,500 each on A. L. Viles, its president, and George Flint, secretary. Fines of $5,000 each were imposed on the following companies: Dayton Rubber Co., Lee Rubber & Tire Corp., United States Rubber Co., Firestone, General Tire, Goodrich, Goodyear, and Seiberling Rubber Co.

J. Francis Hayden, special Assistant Attorney General in charge of the New York office of the anti-trust division, Department of Justice, said the government had dropped charges against J. L. Cochrun, vice president of Seiberling; I. Eisbrouch, Dayton vice president; A. A. Garthwaite, president of Lee Rubber; H. N. Hawkes, assistant general manager, tire division, U. S. Rubber; Lee R. Jackson, executive vice president, Firestone; L. A. McQueen, vice president, General Tire; J. J. Newman, a Goodrich vice president; and R. S. Wilson, vice president of Goodyear.

Another Tire Price Suit Filed

The RMA, Firestone, Goodyear, U. S. Rubber, Goodrich, General Tire, and Lee were named as defendants in a petition filed in Washington, D. C., on October 1 by the National Association of Independent Tire Dealers and 26 members.

The suit is along the same lines as the criminal action brought by the Department of Justice in the Summer of 1947. The tire dealers association asks damages to the extent of $4,266,000, charging that the tire manufacturing firms had drastically lowered profit margins for independent tire dealers. It is stated further, that since 1935 the defendants have been part of a "conspiracy to raise, fix, maintain and make uniform and non-competitive, prices for tires and tubes."

Besides damages the tire dealers asked for an injunction against alleged "conspiracy." They also call on the court to "restore competition" in the industry and to restrain the manufacturers from selling tires to "certain classes" of customers at "discriminatory" prices.

A spokesman for the Firestone company said the filing of this suit by "a few dealers through a trade association seems entirely inconsistent." He declared that his firm has had "friendly and mutually profitable relations with our thousands of independent tire dealers in serving car owners with the highest quality at the lowest cost."

Vice President Wilson, of Goodyear, stated that "insofar as the charges of conspiracy and discrimination are concerned, nothing could be farther from the truth.

"Goodyear has spent millions of dollars and unremitting effort over a long period of years to create successful, efficient dealerships—to bring qualified men into genuine partnership with us. Our efforts have been highly successful, and today these working partnerships number into the thousands," he added. "Proof of our success is found in the long list of dealers who have been in continuous partnership with us for 20, 30, and even 40 years."

Low-Temperature GR-S Production

Approval for the expansion of facilities for the production of 41° F. GR-S to a 183,000 long tons per year rate by the Office of Rubber Reserve, Reconstruction Finance Corp., was reported last month. A release from the RFC, dated October 1, constituted the official announcement of this action by Harley Hise, chairman, RFC. Mr. Hise said that the decision to make the substantial increase in cold rubber production was based on successful machine and road tests and that these tests had satisfactorily demonstrated that this 41° F. GR-S was the best tire tread material known.

It was stated that the plant operated by U. S. Rubber in Borger, Tex., will be one of the first in which additional equipment will be installed.

Lockwood's October *Rubber Report* mentions that this low-temperature GR-S development may have little effect on the short-term view as the bulk of usage will go into tread stocks under the compulsory pattern already established. The long-term implications however, are significant insofar as the new material may prove itself as good or better than natural rubber in a volume-use field.

It means also that there will be a much greater impetus for private industry to buy the improved government plants. Most important of all, it indicates that synthetic research is on the march, and natural research must be equally alert to keep up with the parade, *Rubber Report* concludes.

Production, Sales, Inventory, Etc. Figures

In the June, 1948 issue we reported some figures from the Office of Business Economics of the United States Department of Commerce on manufacturers' sales and inventories for 1947 and the first two months of 1948 for the rubber goods industry. These figures, in millions of dollas, were taken from the February-March "Industry Survey" of that government agency.

The September issue of the "Industry Survey" contains additional figures, but the method of reporting is different. Means of converting the September figures so that they will be comparable with those previously reported are given, however, and the original figures, the new figures, and figures converted back for comparison with the original figures (millions of dollars) for the months March through August, 1948, are given below:

RUBBER INDUSTRY MANUFACTURERS' SALES AND INVENTORY FIGURES

	Sales		Inventories	
Period	Original Millions $	Index Sept. '48	Original Millions $	Index Sept.'48
1947				
July	276	298	558	268
Aug.	288	312	537	258
Sept.	308	346	512	246
Oct.	335	348	513	247
Nov.	303	354	504	242
Dec.	284	307	535	257
1948				
Jan.	261	282	563	271
Feb.	298	289	587	283
Mar.	233	252	628	302
Apr.	289	312	610	293
May	294	317	615	296
June	316	342	614	295
July	314	339	600	289
Aug.	328	354	597	287

Comparison of the sales and inventory figures for July and August of 1947 with the same months in 1948 confirm the greater sales rate in the current year and the higher production rate. A certain significant portion of the 1948 dollar value of both sales and inventories, however, is due to the higher price being obtained for units sold or stored.

The RMA stated on October 15 that manufacturers' shipments of passenger-casings amounted to 6,575,964 units in August, as compared with July shipments of 6,559,976. Production of 5,768,614 units was 4.6% above July, and with shipments exceeding production for the second straight month, inventories declined about 800,000 units to 7,462,765.

Shipments of truck and bus tires were 3.6% less in August, at 1,258,919, as compared with 1,305,968 for the previous month. Production of 1,193,942 was slightly higher than the 1,155,797 units produced in July, and manufacturers' inventories were reduced somewhat to 1,872,-354 units.

The heavy shipments of tires, like high gasoline consumption, are explained by the record number of vehicles on the road and the popularity of long motor vacation trips, the Association said.

Shipments of automotive tubes were up 1.6% to 6,917,140, as compared with 6,-807,414 shipped in July; while production totaled 6,638,552 units, 15.5% higher than in July.

Another measure of industry activity, the monthly report of the Department of Commerce on consumption, production, and stocks of new rubber in the United States for August showed 92,236 long tons consumed, as compared with 83,280 tons in July and 86,290 tons in August, 1947. For the third successive month consumption was greater than in the corresponding month of 1947.

Consumption of natural rubber in August was 53,028 tons, including 1,964 tons of latex. Synthetic rubber consumption totaled 39,208 tons, a figure exceeded this year only in January. The August synthetic total included 29,858 tons of GR-S, 5,739 tons of Butyl, 2,921 tons of neoprene, and 690 tons of nitrile type rubber. Consumption of GR-S in August was 36% of total natural plus GR-S, the highest ratio since January.

Swelled by the largest postwar month's receipts from Netherlands India, 14,956 tons, and by continued large receipts from Siam, amounting to 8,316 tons, August natural rubber imports totaled 68,131 tons, including 2,395 tons of latex.

Production of synthetic rubber in August, cut by the fire in the Baytown, Tex., Butyl plant, amounted to only 39,628 tons, the lowest since February. Output of GR-S was 33,957 tons, up 288 tons from July; neoprene, 2,612 tons, up 523; Butyl 2,634 tons, down 2,432; and nitrile types 785, down 18.

Reported stocks of new rubber available to industry at the end of August were, in long tons: natural, 129,444 (including 11,216 tons of latex); GR-S, 81,-787; Butyl, 7,451; neoprene, 5,340; and nitrile types, 2,412.

United States exports of rubber and rubber products in August amounted to $9,197,489, the lowest figure in many months, according to the Rubber Division of the Department of Commerce.

The decline was attributed chiefly to reduced shipments of truck and bus tires in August and represented a drop of 21.8% from the $11,765,619 in July and a drop of 42% from the $15,946,223 reported in August, 1947. For the first eight months of 1948, exports totaled $93,142,255, a decline of 39.2% from the $153,233,462 registered in the comparable period of 1947.

New rubber consumption during September was estimated at 90,214 long tons in the regular monthly report of the RMA released on October 25, about 2.2% below the August consumption.

Natural rubber consumption in September was 51,400 tons, against 53,028 tons in August, while synthetic rubber consumed amounted to 38,814 tons, in contrast to 39,208 tons in August. Of the September total of synthetic rubbers, 29,-659 tons were GR-S; 3,270, neoprene; 5,208, Butyl; and 677 tons, nitrile types.

For the nine months ending September 30, a total of 813,403 long tons of new rubber, including 475,166 tons of natural and 263,228 tons of GR-S, were used.

World Rubber Production and Consumption

World production of natural rubber in August, estimated by the Secretariat of the Rubber Study Group at 132,500 tons, equaled the June-July average and was well above the 121,250-ton monthly average established during the first half of 1948, the Department of Commerce reported on October 7. Total world output during the first eight months of 1948 is estimated at 977,500 tons, an increase of 170,000 tons over the comparable period in 1947.

August production was maintained despite price recessions in that month. It is possible, however, that August prices might still tend to reduce output in subsequent months, according to E. G. Holt, assistant chief, Rubber Division, Office of Domestic Commerce.

Malayan production in August is reported at between 57,000 and 58,000 tons. Total for other countries was approximately 75,000 tons, highest since the war.

World consumption of natural rubber in August, including total imports into Russia, is estimated by the Rubber Study Group

at 107,500 tons, of which 53,000 tons were used by the United States and 54,500 tons by all other countries.

In the three months ended with August, world production has exceeded world consumption of natural rubber by an estimated 65,000 tons, Mr. Holt revealed. Meanwhile, British Government stocks have been in part sold to the United States Government; the remainder has been set aside as a British strategic reserve and no longer included in published statistics. Stocks in consuming countries at the end of August, exclusive of U. S. and U. K. Government stocks, are estimated at 315,000 tons (129,400 in the United States and 185,600 in other countries), compared with 289,000 tons at the end of 1947, an increase of 26,000 tons. Stocks in producing countries are estimated to have been slightly lower, and stocks afloat slightly higher, on August 31 than on January 1. Stocks afloat for Russia on August 31 are estimated at 31,500 tons.

World production and consumption of synthetic rubbers, exclusive of Russian synthetics, were balanced at 42,500 tons in August. For the first eight months of this year production was estimated at 357,500 tons and consumption at 325,000 tons, stocks increasing 32,500 tons to a total of 110,000 tons at the end of August.

Lockwood's October *Rubber Report* contains some comments on natural rubber quality and packaging by an anonymous author who states that far too great a percentage of receipts of natural rubber into the United States continues to be considerably below quality contracted for, and no improvement in this unsatisfactory condition has been noticed over the last six months, it is added.

New rubber-type samples of the RMA are objected to in the Far East as being too high in quality although they are comparable to prewar samples. It is pointed out that the Far Eastern producers may have overlooked the fact that natural rubber from our stockpiles was being constantly handled and inspected during the war years, and we have not forgotten what prewar grades look like.

"The packaging of the rubber from the Far East also leaves much to be desired, and the poor condition of shipments on arrival presents a major and expensive problem to the dealer and consumer," this author states.

"The complaints are of insufficiently coated bareback bales of R.S.S. with grade and other marks illegible. In the case of Fine Thin Pale Crepe, these are often shipped bareback, and although wrapped with equal quality rubber, the buyer loses on the downgrading of soiled wrappers. Lower grades of Remill Crepes such as #4 Browns and Bark are often shipped bareback and because they are soft pick up dirt or mass badly in transit, if packed in mats the rubber is not dusted with talc and the matting is embedded in the rubber."

The American market would certainly welcome any moves instituted in the Far East to improve quality and packaging of its natural rubber to make it fit for shipment. Over a considerable period suggestions for improvements have gone out from here and also repeated appeals for proper grading of rubber, and it is really putting business in reverse to have the customer plead for better treatment, it is stated in conclusion.

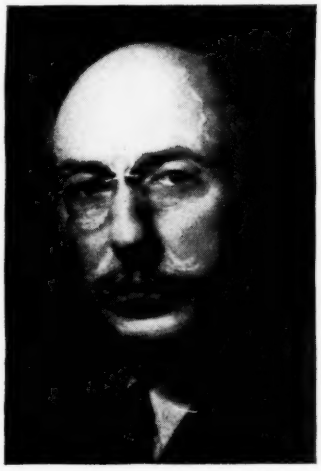
Labor-Management News

A work stoppage was caused at Goodyear's Akron, O., plant between September 18 and 29 by mill room employes who walked off their jobs over a time change for running tube stock. About 4,000 workers were made idle. The three mill room men responsible for the shutdown were suspended for one week, and after their return to work the local union filed a complaint on the specification change which was negotiated through the regular channels.

Fourteen hundred workers at the Dayton, O., plant of Dayton Rubber went on strike on October 12 because of a dispute over wages. The company and the union failed to agree on the wage reopening clause in the regular contract after the company made an offer which it called its last proposal.

U. S. Rubber suspended all production at its main plant in Detroit, Mich., and sent 6,000 employes home on October 22 when a dispute over work standards disrupted operations.

EAST



George W. Ullman

Sun Chemical Corp., 100 Sixth Ave., New York 13, N. Y., at a recent special board meeting elected George W. Ullman president, A. C. Horn, chairman of the executive committee, and Vice President Wm. Recht a director. A. E. Horn, president of A. C. Horn Co. Division of Sun Chemical, and Ernest Nathan, president of Warwick Chemical Co. Division, were elected vice presidents of the parent organization. Also announced were the retirement of Albin K. Schoepf and the resignation of James W. Raynolds.

The General Tire & Rubber Co., Akron, O., has sold its Frostair division to the Deep Freeze division of the Motor Products Corp., Detroit, Mich., including patents, tools, and dies. Frostair, a home refrigerator unit, was manufactured at a Morrison, Ill., plant, but this operation now will be transferred to Deep Freeze's North Chicago plant.

In announcing the sale, Max Gilman, Frostair's general manager, said:

"General entered the refrigerator field originally for the purpose of providing a source of additional revenue for its distributers and dealers. We found, however, that to remain in the field it would be necessary for us to increase the line and get both feet into the appliance business. Rather than do this, which might constitute a serious distraction from the tire business, we felt it would be more sensible to turn the operation over to a good, responsible concern already in the appliance field."

SKF Industries, Inc., Philadelphia, Pa., has developed an improved type of rubber-cushioned propeller shaft box which absorbs the destructive vibration occurring in trucks and busses operating at high speeds. According to Richard H. DeMott, company vice president, the unit substantially reduces driver fatigue and maintenance problems by preventing the spread to a vehicle's chassis of vibrations caused by propeller shafts revolving at high speeds. The device, which supports the shaft joining the transmission to the rear axle, consists of a housing whose outer and inner rings are separated by an oil-resistant rubber cushion and a self-alining ball bearing free to move lengthwise in the shaft box. The rubber cushion is "shot" between the two rings of the housing at high velocity, Mr. DeMott explained, and is held in place by mechanical friction, thus eliminating the need of vulcanizing. A metal labyrinth seal protects the bearing against dirt, dust, and road splash.

General Latex & Chemical Corp., 666 Main St., Cambridge 39, Mass., has appointed J. H. Faull, Jr., director of research. Dr. Faull, a graduate of Harvard University, entered the rubber field in the Thirties when he joined the Firestone Tire & Rubber Co., Akron, O. He subsequently became a member of the technical staff of General Latex, from which he received a leave of absence, however; during the late war to become technical superintendent of the ORR GR-S plant at Baytown, Tex., operated jointly by General Latex and The General Tire & Rubber Co. Dr. Faull also served during his leave as head of the Scientific Section, Boston Branch, Office of Naval Research, and on numerous government technical committees incidental to the national synthetic rubber program; he is still an active member of the Copolymer Development Committee. As part of his new duties the General Latex executive will continue his association with the Baytown plant and certain ORR technical committees. Dr. Faull belongs to the American Chemical Society, Boston Rubber Group, Alpha Chi Sigma, Sigma Xi, Torch Club of Houston, Franklin Club of Akron, The American Institute of Chemists, Boston City Club, and Harvard Club of Boston.

Burgess Pigment Co., Sandersville, Ga., has appointed George F. Blasius executive vice president and director in charge of sales and new product development. He was formerly vice president and technical director of Hercules Filter Corp. With the appointment of Mr. Blasius, Burgess Pigment has opened executive sales offices at 64 Hamilton St., Paterson, N. J.

Burgess Pigment Co., is an affiliate of Thiele Kaolin Co., producer of paper coating and filling clays. The company is erecting a new $300,000 plant adjoining that of Thiele Kaolin at Sandersville, for the production of modified clays, mechanically and chemically treated, for the paper, rubber, plastics, paint, leather, textile, chemical, and other industries.

Frank B. Pope

Frank B. Pope has joined the sales department of Sharples Chemicals, Inc., Philadelphia, Pa. He will be a member of the Chicago sales office, and his territory will consist of North and South Dakota, Wisconsin, Michigan, Minnesota, and Ohio. Dr. Pope was formerly with The B. F. Goodrich Co.

Hewitt-Robins, Inc., Restfoam Division, Buffalo, N. Y., with completion of expanded production facilities at its latex foam plant, has announced the inauguration of its long-planned mattress topper pad program to make Restfoam cushioning available to bedding manufacturers. The new $850,000 addition to the plant already is turning out mattress topper pads in full and twin bed sizes as well as a special hospital size, according to J. H. Hayden, vice president in charge of sales. Said to be the most modern and most efficient latex foam production line in the rubber industry, the new facilities are expected to double the company's latex foam capacity and will emphasize the new mattress topper pad program. Mr. Hayden also said that a special sales program has been launched offering mattress manufacturers the opportunity of marketing innerspring mattresses topped with Restfoam pads.

C. W. Staacke, a member of The B. F. Goodrich Co.'s engineering staff for 22 years, has joined Hewitt-Robins as a technical consultant, and in this newly created post at Hewitt, will be special assistant to Thomas Robins Jr., company president. Mr. Staacke is credited with several major improvements in conveyer belt design. His duties will include serving as technical coordinator of the research and development activities of Hewitt Rubber Division, Buffalo, which manufactures rubber belting; Robins Conveyors Division, Passaic, N. J., which manufactures the conveyer machinery components, and the Robins Engineers Division, New York, N. Y., which designs and installs complete material handling systems. Mr. Staacke will maintain his office at 370 Lexington Ave., New York.

Franklin L. Klocke has been named factory representative for Hewitt Rubber in North Carolina and Virginia and for Hewitt Restfoam Division in the Southeast. After joining the Hewitt organization Mr. Klocke assisted in setting up the pilot plant for the manufacture of Restfoam, switched to the sales department in March, 1946, and was made eastern product manager in January, 1948.

Holland W. Smith, Inc., Empire State Bldg., New York 1, N. Y., has been appointed exclusive sales agents for the states of Maryland, Delaware, New Jersey, New York, and Pennsylvania east of Harrisburg for mixers and mills of Hy-R-Speed, Inc.

Farrel-Birmingham Co., Inc., Ansonia, Conn., recently elected Robert M. Honegger, general manager of the Buffalo plant, to the board of directors. A native of Buffalo, Mr. Honegger first entered the employ of the Farrel company in 1925 as a member of the engineering department. Following four years in engineering and sales, he had six years of shop experience and in 1935 was appointed general foreman. Shortly after he became plant superintendent and in June, 1945, was promoted to his present position.

Robert M. Honegger

Eagle-Picher Elections

T. Spencer Shore, 45-year-old industrialist and investment banker, was elected president of the Eagle-Picher Co., Cincinnati 1, O., at the regular monthly meeting of the board of directors on October 22 and will assume office January 1. Joel M. Bowlby, president since 1941, became chairman of the board and will continue as chief executive officer and general manager of operations of the Eagle-Picher group. Joseph Hummel, Jr., associated with Eagle-Picher for 57 years and board chairman since 1941, was appointed honorary chairman. Elmer Isern, formerly vice president of the Eagle-Picher Mining & Smelting Co., was elected president of that subsidiary; while Mr. Bowlby became chairman of the board.

According to Mr. Bowlby, these changes in top personnel were made to develop younger executive talent to assist in the direction of the company's greatly increased volume of business. Mr. Shore has been a member of the company's board of directors since 1943, at which time he was vice president and treasurer of The General Tire & Rubber Co. While maintaining its position as an important producer of zinc and lead, Eagle-Picher has greatly expanded and extended its nonferrous processing operations and has entered extensively into the building materials field.

United Elastic Corp., Easthampton, Mass., recently was awarded by the New York Quartermaster Purchasing Office an order for 605,000 yards of elastic webbing.

Plastics Productions, Inc., has moved from 1602 Pauger St., New Orleans, La., to larger quarters at 322 Tchoupitoulas St., and has made a change in officers of the firm. Aruns Callery was elected vice president and Killian Huger secretary-treasurer. Ralph F. Chambers is president of the concern. Erwin Reveri, former production superintendent of one of New York's largest fabrications of plastics, has been appointed to that position at Plastics Productions, Inc.

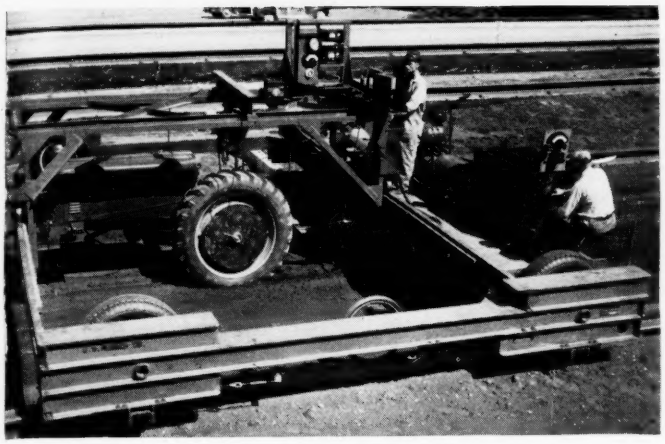
The change in location, the second expansion of the firm during the past two years, has enabled the company to more than triple the floor space. Besides production and custom work, the firm has gained a wide reputation for its research work in the plastics field.

Many local manufacturers have taken advantage of home industry and are now for the first time having their plastic merchandising ideas executed in New Orleans. Hospital equipment, display fixtures, steamship accessories, decorature effects, formerly shipped into this area from the North, are being produced in increasing volume at the firm in its new quarters.

Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., has appointed W. F. Twombly vice president in charge of manufacturing. He has been with Witco since 1946 and was an assistant director of the WPB Chemicals Bureau during the war. Prior to that time he had been engaged for several years in chemical research and manufacture.

Witco's manufacturing facilities have been recently augmented by the completion of a specialty asphalt plant at Perth Amboy, N. J., which supplements asphalt plants in Chicago and Lawrenceville, Ill. Increased production facilities for metallic stearates have been installed in the Brooklyn and the Chicago plants, and a new, larger plant is now in operation at Chicago for the production of paint driers. Other manufactured products include Sunolite, an anti-sun checking wax; Monty wax; rust preventives; sound deadening mastics; and automotive undercoatings marketed under the name of Witcote.

W. F. Twombly



New Machine Developed by U. S. Rubber for Measuring Performance of Farm Tractor Tires

U. S. Rubber Notes

A unique and highly scientific machine which measures the efficiency of rubber tires on farm tractors and will help reduce the farmer's fuel bill has been developed by United States Rubber Co., Rockefeller Center, New York 20, N. Y. The only device of its kind in existence, the machine is being used in a series of experiments conducted jointly by the company and the United States Department of Agriculture to determine tractor tire performance under a wide range of loads and in various types of soil. These experiments are taking place at the Department's tillage machinery laboratory at Alabama Polytechnic Institute. In these experiments a tractor equipped with a single tire is mounted on the machine and driven over a specially prepared soil bed approximately 250 feet long. Delicate instruments record the amount of drawbar pull, traction, and slippage of the tire in relation to the power applied on the wheel. Each tire undergoes tests in three different types of soil better to approximate actual service conditions. Each tire test involves 12 different drawbar loads, making 36 individual runs per tire. According to J. W. Shields, company development engineer, results to date show that tires vary radically in performance owing largely to differences in construction and tread design.

Increases in the prices of electrical wire and cable were announced by U. S. Rubber effective November 1. Prices for copper and aluminum building wire, service entrance cable, and non-metallic sheathed cable were raised 5%; while prices for lead encased cables were raised 10%, it was revealed by C. W. Higbee, manager of the wire and cable department. The increases are the direct result of raw materials costs, which in some cases have tripled since before the war. These advances, coupled with sharply higher labor and production costs, have been too great to allow them to be fully absorbed in selling prices, Mr. Higbee explained.

H. R. Mack has been appointed merchandising manager, U. S. Tires division. Mr. Mack joined the company in 1937 as a tire salesman in Buffalo; was made district manager there in 1938; was appointed manager of truck tires with headquarters in New York in 1942; transferred to Los Angeles in 1945, in charge of truck tire sales for the Pacific Coast; returned to New York in 1946 as district manager; and subsequently was made eastern division manager with headquarters in New York.

Homer P. Bond has been named district sales manager for the Atlanta, Ga., branch of the mechanical goods division to succeed Harry G. Warren, retired.

C. R. Bitz has been appointed district sales manager in Birmingham, Ala.

Changes at Columbian Carbon

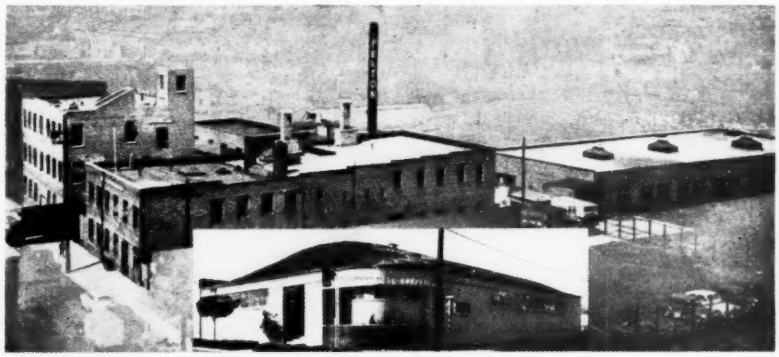
At the regular directors' meeting of Columbian Carbon Co., 41 E. 42nd St., New York, N. Y., October 15, the following officers were elected to fill existing vacancies: Robert M. Hillas, chairman of the board; Carl E. Kayser, president; and T. R. Goebel, a vice president.

Mr. Hillas has been actively connected with Columbian Carbon the past 15 years as a member of the board and since 1940 as a vice president.

Mr. Kayser came to the company on January 1, 1946, as executive assistant to the president, the late Reid L. Carr, and since April, 1948, has served as a vice president actively engaged in all phases of the business of the company. For more than 35 years, Mr. Kayser, in various operating and executive capacities, has been closely identified with the natural gas, oil, and carbon black industries. From May, 1933, until Mr. Kayser joined Columbian Carbon, he had been president of Carbon Black Export, Inc., which during that period had been the exporter of from 70 to 85% of all carbon black shipped abroad from the United States. During various periods after May, 1933, Mr. Kayser has served in an advisory and executive capacity in various trade associations and trade authorities in the carbon black industry. Mr. Kayser is also a member of the American Petroleum Institute, the American Gas Association, Independent Natural Gas Association of America, and Texas Mid-Continent Oil & Gas Association.

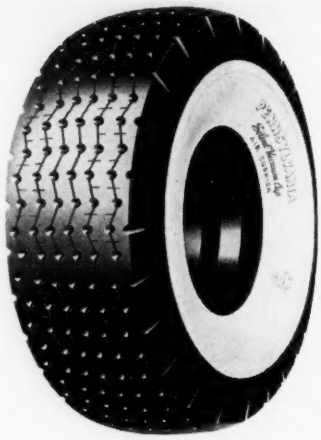
Mr. Goebel formerly was the regional director of gas and gasoline operations for Shell Oil Co., Inc., Houston, Tex. On November 1, Mr. Goebel opened up and now is in charge of Columbian Carbon at Houston, for the purpose of implementing the company's program of enlargement of its activities and operations in gas, gasoline, and oil.

Felton Chemical Co., 599 Johnson Ave., Brooklyn, N. Y., has enjoyed a period of growth and expansion since its establishment 25 years ago. Now marking its twenty-fifth anniversary, the company originally entered into the manufacture of aromatic and flavor chemicals in quite modest quarters under the direction of Joseph Felton. The first World War demonstrated the dependence of the American people on the highly developed European flavor and aromatic industry and resulted in the origin and development of a domestic industry. The phenomenal growth of this infant industry is the history of the Felton Chemical Co. As the company prospered, the small building it occupied on Taafe Pl. was soon found inadequate, and a new building, the first of five units, was erected at the present address in 1927. The company's executive offices are now located at this site. The newest building in the group, only recently completed, is a four-story steel and brick structure with an interior completely finished in glazed tile. With the simultaneous occupation of its new building in Los Angeles, Calif., a few months ago, the company's expansion program initiated five years ago is brought to completion. Officers and directors of the company are: president, Dr. Felton; vice president, Louis Gampert; and secretary-treasurer, Sophie Felton. The company maintains offices and stores in Boston, Mass., Philadelphia, Pa., Chicago, Ill., St. Louis, Mo., San Francisco, Calif., and Toronto, Ont., Canada, and a factory at 781 Williams St., Montreal, P. Q., Canada.



Brooklyn, N. Y., Plant and General Offices of Felton Chemical Co.; Inset, Los Angeles, Calif., Plant

Pennsylvania Rubber Co., Jeannette, Pa., through R. B. Cave, vice president in charge of sales, has announced the new seven-rib Silent Vacuum Cup Air Cushion tire. The improved seven-rib feature provides more slots and buttons than the six-rib type, and the slots are wider and shorter and are taken from the center of the cups instead of the side. The tread width, arc, and depth have been modernized to give a premium-quality low-pressure tire. The arc is narrow and flattened, and the tread depth is increased over that of the company's previous tire models. Constructed of six plies of 1100-denier rayon, the cord body gives a tough, rugged, bruise resistant tire which is said to retain the flexibility and resiliency of a four-ply tire. The new tire employs a dual-purpose tread compounded to permit greater heat dissipation.



New Pennsylvania Silent Vacuum Cup Air Cushion Tire

New Jersey Zinc Co., 160 Front St., New York 7, N. Y., has used the slogan, "Satisfied customers are the backbone of our business," as the theme of a series of attractive and informative posters which have appeared in the company's plants for the past year. At the beginning of this year, in searching for a theme for a new series of plant posters, the company employe relations department decided that the slogan would be an ideal subject for an extensive educational campaign among the 7,000 production employes of the organization. In order to emphasize the point that the company's good business depends on the maintenance of high quality in its zinc pigments and metals, each poster dramatizes the case history of a particular long-time customer. One of these posters, that dealing with the story of an automobile tire manufacturer, is shown in the accompanying illustration. To date the records of eight customers in such industries as paint, rubber, die casting, brass, galvanizing, ceramic, cosmetic, and steel have been chosen for the series. The poster copy gives specific reasons why the particular company product is preferred by the customer, and in several cases the particular operation employing the zinc product is illustrated.

SATISFIED CUSTOMERS
are the backbone of our business
Here is another customer of New Jersey Zinc.
He makes automobile tires. Many thousands of automobile owners buy his tires—have bought them for many years—because his tires are good tires.
Back in 1906 we sold this manufacturer Horse Head XX zinc oxide to use in his tires—and he has been buying XX ever since. This zinc oxide gives him exactly the properties he wants, and has helped to establish the good reputation his tires enjoy.
Many people in our Company play a part in making this manufacturer a satisfied customer.
zinc

Typical Poster Used by New Jersey Zinc Co. in Its Employe Educational Campaign

Reorganizes Chemical Department

Harry K. Collins and John L. McMurphy have been named to managerial posts of the plastics and the chemicals divisions, respectively, in an announcement, October 8, of a reorganization of the chemical department of General Electric Co. at Pittsfield, Mass.

Under the new chemical department organization, which establishes two operating divisions instead of four, Mr. Collins will be responsible for the product engineering, manufacturing, sales, and accounting functions with respect to: mica, varnished cloth and paper, magnets and other metallurgical products, and laminated, molded, and fabricated plastics. Mr. McMurphy will be similarly responsible for: Glyptal alkyd resins, wire enamels, insulating varnishes and paints, silicones, magnesium oxide, phenol, phenolic and other molding compounds, resins, and varnishes.

Assisting Mr. Collins are: Frank W. Warner, engineering manager; Robert O. Bullard, manufacturing manager; Donald S. McKenzie, sales manager; Elmer H. Gabel, accountant; and Arthur C. Treece, assistant to Mr. Collins on laminated products.

Mr. McMurphy's staff includes: C. Stewart Ferguson, engineering manager; John A. Zellhoefer, sales manager; Robert A. Rieker, accountant; and Erwin T. Kilgore, assistant to Mr. McMurphy on silicones.

Mr. Collins, who started with G-E in 1926, was most recently manager of the resin and insulation materials division; while Mr. McMurphy, with the company since 1930, served as manager of the compound division of the chemical department before his latest promotion.

Robert L. Gibson, formerly manager of the plastics division, now is assistant general manager of the chemical department. He first came to the company in 1925.

Charles E. Reed has been appointed engineering manager of the chemical department and as such will have responsibility for new product development, chemical engineering process development, methods and equipment development, facilities engineering, and engineering policy for the department. Dr. Reed, who joined G-E in 1942, most recently served as manager of the chemical engineering division of the chemical department.

The B. F. Goodrich Co., Akron, O., has appointed R. G. Jeter, one of Akron's leading attorneys, general counsel. Mr. Jeter was born on a farm near Conway, Ark., March 13, 1909, but has lived in Akron since early childhood. He attended the Akron public schools and Akron University and was graduated from Ohio State University in 1932 with the degree of Bachelor of Laws. He was admitted to the practice of the law in Ohio the same year. The new Goodrich general counsel had his first job with the company, working in the factory during summer vacations while attending college. He is a member of the bars of the Ohio State courts, the United States District Court for the Northern District of Ohio, and of the Fourth and Sixth United States Circuit Courts, and of the Akron, Ohio State, and American Bar associations, and the Akron City and Portage Country clubs.

Passengers in Chicago's new Dearborn St. subway will be carried as gently as eggs, thanks to the cushioning action of 40,000 rubber pads made by Goodrich. The deep-dimpled, ¾-inch pads, which resemble egg crate partitions, will be used between rails and tie plates to reduce noise and vibration. Tests show that the pads have a life expectancy of 50 years.

Koroseal, Goodrich's flexible synthetic product, is making striking advances in the field of interior automobile design. Among the latest Koroseal products are door-lock lever knobs and window grommets now standard equipment on several cars. The door-lock comes in various colors and will outlast similar conventional levers made of hard rubber, it is said. These Koroseal knobs have color molded into the unit; therefore the color will not chip or wear off. The door grommets are used where two pieces of metal door trim meet and are claimed to be long wearing and resistant to aging.

Goodyear Developments

The application of Pliolite resins in the formulation of industrial and highway paints, water emulsion paints, lacquers, and other coating materials will be demonstrated by the chemical division of Goodyear Tire & Rubber Co., Akron, O., at the National Paint Show in Chicago, Ill., on November 4 to 6. Special emphasis will be placed on the newer resins, according to Herman R. Thies, division manager, although Goodyear will also display Pliolite S-5 in both resin form and in a complete line of pigmented bases. Among the new materials to be shown are Pliolite Latices 150 and 170, whose abrasion resistance, toughness, adhesion, waterproofness, chemical resistance, and continuous film forming properties make them particularly adaptable as coatings for paper and fabrics, as sealers for wood, composition flooring, and plaster, and as bases for water emulsion paints. Pliolite S-7, although designed primarily as a paper coating, will also be shown as a possibility for protective coatings, sealers, heat sensitive adhesives, and as a constituent in other types of coatings.

Two years of development and testing have resulted in a new Goodyear rear tractor tire, the Super Sure-Grip. The result of field tests with 26 designs and patterns of tires under all types of soil conditions, the new tire has six major improvements, as compared with previous tractor tires made by the company. Tread width has been increased to provide broader contact with ground surfaces, giving greater drawbar pull to the tractor. A new, uniform, evenly spaced tread design gives smoother rolling and uniform operation not obtainable in treads of eccentric pattern. Longer tread bars with increased bar depth at the shoulder supply full depth bite for the full length of the bar. The new tread bars, which are also deeper and wider, give greater traction and longer wear. Sizes of the new tire range from 6-24 to 15-32, including the popular 9-38 and 13-38 sizes.

A special textile V-belt for individual motor drives on spinning frames and similar equipment has been announced by Goodyear's mechanical goods division. Known as the Goodyear Textile Special, the new belt is being made in sizes to fit standard "B" section V-belt sheaves. Development of the belt follows extensive testing and research at several textile mills, according to J. F. Taylor, V-belt department manager, who said that the new belt is designed to withstand the severe overloads resulting from high starting torque to which frame drives are subjected. Belt tension members are constructed to provide over 100% increase in breaking strength and to give under shock loads. The life expectancy of the new belt is greater than that of conventional V-belts because of extra thickness of the outside cover and improved design which assures even distribution of the wearing surfaces on sheave grooves. Greatest use of the new belt is expected on equipment requiring multiple V-belt drives.

A new patriotic film, "A Letter from America," produced by Goodyear as part of its fiftieth anniversary program, has been made available for public showings, it was announced by P. W. Litchfield, chairman of the board. Goodyear, as a company, figures only incidentally in the movie, whose theme is how an individual reared under a totalitarian system of government reacts to the American way of life. The film combines the life stories of a number of the company's foreign-born employes into the story of a man who came to this country 50 years ago and happened to obtain a job with the organization.

A "synthetic rubber" street is one of the newest developments to come out of Akron. In resurfacing a section of Exchange St., one of the city's busy thoroughfares, a new hot mix combination including finely powdered synthetic rubber blended with conventional asphalt black top was used. The plan was suggested by Goodyear's research department, and the rubber was supplied without cost. The new mix is said to give a more nearly waterproof surface than regular black top applications and is therefore expected to be more resilient, longer wearing, and more resistant to cracking in cold weather. The idea for the rubber pavement originated in England and Holland, which have employed it successfully for several years. One such road in Holland attracted the attention of P. W. Litchfield, Goodyear chairman, on a visit there since the war. Much impressed, Mr. Litchfield brought it to the attention of the company's research department, which worked out details for such a road surfacing material. Small sections of two city streets were paved with the new material about a year ago and have stood up well. If the Exchange St. project is equally successful, it is likely that a new field for synthetic rubber will be opened up.

Motorists who neglect proper inflation of their tires, or who unknowingly operate them at incorrect air pressures, are robbing themselves of a considerable portion of the tire's life while also adversely affecting car performance, according to W. E. Shively, Goodyear manager of tire design. This point is especially true with low-pressure tires which show a larger percentage of pressure loss when underinflated, with consequent premature tread wear, Mr. Shively said, pointing out that users of low-pressure tires now consider 24 pounds' air pressure as a maximum to be maintained and reduce any surplus to that amount. Bleeding air from hot tires has always been advised against by tire manufacturers and can be especially harmful, therefore, in low-pressure tires. The cold tire air pressure recommended by the car or the tire manufacturer should always be used, together with regular weekly checking of tire pressures by the motorists with an accurate gage to avoid improper inflation.

Eugene R. Coate has been made sales manager of printers' supplies. He has been with Goodyear since 1936, starting in Brooklyn, N. Y., as a shoe products salesman. Later he held sales posts at Hartford, Conn., and Atlanta, Ga., and in 1942 came to Akron on the production staff of Goodyear Aircraft Corp. In 1945, Mr. Coate became Goodyear's field representative for printers' supplies in the West and for the last year was acting sales manager of the department.

Wm. E. Campaigne, formerly chief chemist of Pretty Products, Inc., Coshocton, O., has joined Goodyear as a compounder in the industrial products division.

A. M. Borders, physical chemist in the Goodyear research laboratories, recently left that company to take up new duties with the Institute of Paper Chemistry, Appleton, Wis.

O'Sullivan Rubber Corp., Winchester, Va., has decided to offer the remaining 325,000 shares of its presently authorized and unissued common stock of $1 par value in order to provide additional funds to be used for defraying expenses involved in the construction and equipping of the new plant recently completed for the manufacture of plastics.

Plymouth Rubber Co., Canton, Mass., according to President Joseph M. Hamilburg, decided to omit the common dividend due in September because dividends already paid have exceeded earnings to date.

WEST

Executive Changes at Monsanto

Several major changes in the administrative organization of Monsanto Chemical Co., St. Louis, Mo., have been approved by the board. The three-man executive committee was increased to five members. Besides the present members, Edgar M. Queeny, chairman of the board, Wm. M. Rand, president, and Charles Allen Thomas, executive vice president and technical director, Vice Presidents Osborne Bezanson and R. R. Cole were elevated to the committee.

Mr. Bezanson was formerly general manager of the organic chemicals division with headquarters in St. Louis. Mr. Cole was formerly general manager of the company's phosphate division, also headquartered in St. Louis. Mr. Bezanson is succeeded by W. G. Krummrich, assistant general manager of the division, who will serve as acting general manager. John Christian, manager of the plant at Monsanto, Tenn., will replace Mr. Cole as acting general manager of the phosphate division.

Vice President Francis J. Curtis, who will continue his position as secretary of the executive committee, also was placed in the new position of sales coordinator, in which capacity he will coordinate the sales of the company's six divisions and supervise the activities of the foreign and advertising departments.

Carroll A. Hochwalt, vice president in charge of the company's central research department at Dayton, O., assumes responsibility for the coordination of the company's research and development activities. Dr. Hochwalt will be succeeded as head of the central research department by the associate director, Howard K. Nason, who will serve as acting director.

Fred G. Gronemeyer has been assigned to the newly created post of chief engineer of the company's organic chemicals division. Mr. Gronemeyer, who for the past 16 months has been director of general engineering, will continue in charge of that department until a successor has been appointed.

Edward J. Bock, superintendent of maintenance at the Monsanto, Tenn., plant been made plant manager there and has been succeeded in his former post by Olin R. Bailey, chief construction engineer for the company's phosphate division.

Robert H. Gerster, formerly chief chemist of Inland Rubber Co., is now with Monsanto's Rubber Service Laboratories, Akron, specializing in technical service on tire compounding problems.

Monsanto has announced the completion of negotiations for settlement of the insurance claims for losses sustained at the Texas City plant in the disaster of April 16, 1947. Mr. Rand said that negotiations were concluded with the Oil Insurance Association of Chicago, and the sum agreed upon was $17,312,000, believed to be the largest single insurance payment in history. Monsanto's original claim was for $21,542,999. The company had carried $14,750,000 in property insurance and $7,000,000 in use and occupancy insurance with the Association. A supplemental use and occupancy policy for $567,937 was carried with Lloyds of London.

Monsanto has been judged as having the best 1947 annual report of the chemical industry in the Annual Report Survey made by the *Financial World*. The bronze "Oscar of Industry" trophy was presented to President Rand at the Annual Awards Banquet in the Hotel Pennsylvania, New York, N. Y., October 21.

Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., has announced that Ralph M. Hoffman, president of Link-Belt Co., Pacific Division, San Francisco, Calif., was elected a vice president of the parent com-

pany at the recent directors' quarterly meeting in Chicago. Mr. Hoffman joined the predecessor of the Pacific Coast company—Meese & Gottfried Co.—in 1913. During his long career Mr. Hoffman has served in many executive capacities in both the parent and the subsidiary companies. He continues president of Link-Belt Co., Pacific Division, the position he has held since 1943.

Paint Industries Show, scheduled for the Congress Hotel, Chicago, Ill., November 4-6, included among its exhibitors: Paul O. Abbe, Inc.; Advance Solvents & Chemical Corp.; American Cyanamid Co.; Bakelite Corp.; Baker Castor Oil Co.; Binney & Smith Co.; J. H. Day Co.; Durez Plastics & Chemicals, Inc.; General Electric Co.; Goodyear Tire & Rubber Co.; Hercules Powder Co.; Hy-R-Speed, Inc.; Minnesota Mining & Mfg. Co.; National Lead Co.; Neville Co.; Newport Industries, Inc.; Patterson Foundry & Machine Co.; PlasKon Division, Libbey-Owens-Ford-Glass Co.; R-B-H Dispersions Division, Interchemical Corp.; Reichhold Chemicals, Inc.; Resinous Products Division, Rohm & Haas Co.; Shell Oil Co.; Shell Chemical Co.; and U. S. Industrial Chemicals.

PACIFIC COAST

Maurice O. Barr has assumed new duties as technical representative for the Associated Lead & Zinc Co., Seattle, Wash., a corporation formed by The Eagle-Picher Co., Cincinnati, O., and Northwest Lead Co., Seattle. In his new position Mr. Barr will be responsible for the sales and services operations of Associated Lead throughout the West, concentrating on the battery, paint, ceramic, rubber, and petroleum industries. Mr. Barr joined Eagle-Picher in 1930 as technical representative of the pigment division and, while a member of the organization, had been stationed in Dallas. He is succeeded there by Wade H. Martin, Jr., formerly of the Joplin research laboratory of Eagle-Picher, who will now cover the battery, paint, ceramic, rubber, and petroleum industries in five southwestern states.

Franklin Rubber Co., Inc., 419 S. Hindry Ave., Inglewood, Calif., according to Harry Franklin, has added to its staff R. H. Newell and Bert Dutton.

Raybestos-Manhattan, Inc., Passaic, N. J., has opened its new warehouse and office at 4651 Pacific Blvd., Los Angeles 11, Calif., to service and stock rubber goods and packings for industrial and oil field requirements for southern California. This warehouse will supplement and service distributers' stocks of standard products to permit prompter deliveries. It will be in charge of Schuyler V. V. Hoffman and is part of the West Coast division sales headquarters, 131 Mission St., San Francisco, where Littleton C. Barkley is general sales manager of the division. Frank W. Sauger, equipment sales, West Coast division, will also make his headquarters at the new address in Los Angeles.

Ralph M. Hoffman

Hayes B. Robinson is now in charge of the extrusion department of Reeves Rubber, Inc., San Clemente, Calif. He had previously been associated with Kirkhill Rubber Co.

H. C. Lien Rubber Co. is now at 1171 E. 63rd St., Los Angeles, Calif. Howard Lien, head of the company, has also announced that Philip Suka, formerly with Mission Rubber Co., has joined the company.

Albert P. Bruce has left the Lamb Rubber Corp. to devote all his time to the Ellay Rubber Co., Pacoima, Calif., of which he is part owner.

Bill Michalak recently resigned from Kirkhill Rubber Co., to enter the employ of Plastic & Rubber Products Co., Hyde Park Blvd., Los Angeles, Calif.

CANADA

Canadian Rubber Statistics

Domestic production of synthetic rubber in Canada declined in July, amounting to 2,750 long tons, as compared with 3,480 tons in July, 1948; while production of reclaimed rubber also dropped, from 225 to 210 tons. End of July stocks, as compared with a year ago, follow: natural rubber, down from 10,045 to 5,478 tons; reclaimed rubber, down from 2,629 to 1,916 tons; and synthetic rubber, up from 3,733 to 5,323 long tons. Consumption of natural rubber in Canada during July totaled 2,909 tons, contrasted with 2,433 tons in July, 1947. Consumption of synthetic rubber and reclaimed rubber decreased from levels of the previous year, synthetic consumption dropping from 2,059 to 1,402 tons in July, and reclaim consumption declining from 1,120 to 951 tons.

1946 Rubber Industry

The Canadian Government's general manufacturing statistics department in its report for 1946 states that the Dominion's rubber industry is of considerable importance in the industrial life of the country and that Canada now ranks among the leaders in rubber goods manufacturing. The report shows 60 establishments were manufacturing rubber tires, footwear, and other products in Canada in 1946; 32 plants were in Ontario, 20 in Quebec, two each in Manitoba and Saskatchewan, and three in British Columbia. These plants furnished employment to 22,055 persons, who received $37,813,636 in salaries and wages and produced goods valued at $159,408,113 from materials costing $62,135,578.

A notable feature in 1945 and 1946 was the increase in the output of automobile tires, which rose from 855,224 in 1944 to 1,303,151 in 1945 and 1,894,893 in 1946. Other features were the resumption of large-scale exports of rubber footwear and the increasing use of natural rubber. Of the three main types of products made by the industry in 1946, rubber tires and tubes accounted for more than 46% of the total production gross value, rubber footwear for almost 17%, and other rubber goods for the balance. Compared wtih the previous year, the output of rubber tires and tubes in 1946 decreased in value by $11,623,150, or almost 14%; footwear increased in value by $1,577,623, or more than 6%; and other rubber goods slumped in value by $11,959,586, or almost 17%. The industry as a whole thus showed a decrease of $22,005,113 in the gross value of production.

A. Schrader's Son Division, Scovill Mfg. Co., Inc., 470 Vanderbilt Ave., Brooklyn 17, N. Y., U.S.A., has appointed George A. Warlow sales manager of its Canadian company, with which he has been associated for more than 19 years.

Schrader also named Thomas W. Hall manager of its Toronto branch, succeeding the late Allan Rae. Mr. Thomas, with the Canadian organization since 1925, spent the last 20 years as office manager.

Gutta Percha & Rubber, Ltd., Toronto 3, has appointed C. A. Sellers manager of the Winnipeg branch, embracing Manitoba and the Lake Head district, to succeed the late R. A. McClellan. Mr. Sellers joined the company in 1925 and 10 years later transferred to the sales force, where he remained until his recent appointment except for three years spent in the RCAF.

R. M. Ferguson & Co., 66A Roslin Ave., Toronto, Ont., has been appointed sales agent in Canada by The Spencer Products Co., Paterson 3, N. J., U.S.A., for its accelerator-activator, Ridacto. Mr. Ferguson is representing a selected number of United States concerns supplying materials to the rubber, ceramic, plastics, and allied fields.

Barringham Rubber & Plastics, Ltd., Oakville, Ont., according to President Edward Barringham, has appointed Albert C. McCoy vice president in charge of sales and production, MacKenzie Robinson secretary-treasurer, and C. Vaughan assistant secretary-treasurer. Both McCoy and Vaughan have been with the company for several years. Barringham, a large manufacturer of rubber and plastic sheeting, in the Fall of 1946 began an expansion program involving the erection of a new two-story building, the installation of new machinery and equipment, and the rearrangement of production lines to increase volume and diversification of products. The expansion program is nearing completion, and it is expected that the new equipment will be installed this fall, and full production reached by the end of the year.

NEWS ABOUT PEOPLE

Robert W. Stokes has been appointed sales manager of W. T. LaRose & Associates, Inc., Troy, N. Y., manufacturer of Thermall electronic heating equipment for the plastics, rubber, and wood-working industries. Before this appointment Mr. Stokes had been eastern district manager of Girdler Corp.'s Thermex division.

F. Scott Carpenter has been added to the special carbon blacks section of the research and development department of Godfrey L. Cabot, Inc., raw materials manufacturer, 77 Franklin St., Boston 10, Mass. A graduate of Massachusetts Institute of Technology, Mr. Carpenter was formerly with the Grasselli chemicals division of E. I. du Pont de Nemours & Co., Inc.

Mrs. Edith K. Timken, widow of Henry H. Timken, founder of The Timken Roller Bearing Co., Canton, O., died at her summer home in Sudbury, Ont., Canada, on October 4.

Bradway S. Phillips, until recently with Seiberling Tire & Rubber Co., Akron, has joined the Bearfoot Sole Co., Wadsworth, O.

A. A. Hally has been named sales manager in charge of Texcel sales for Industrial Tape Corp., New Brunswick, N. J. With Dennison Mfg. Co. for the past 23 years, Mr. Hally most recently was its eastern district sales manager.

Joseph B. Larkin, chief chemist of Patterson Ballagh, Division of Byron Jackson Co., Los Angeles, Calif., was recently married to Miss Lena Cook. After a honeymoon at Lake Tahoe the couple established residence at 2336½ Hauser Blvd., Los Angeles.

Charles Lamb, Sr., and his wife are on an extended visit to England, where they will remain until after the new year. Mr. Lamb is well known as a rubber consultant on the Pacific Coast.

Otto L. Schweng has been named to the newly created post of director of market research for Diamond Alkali Co., Union Commerce Bldg., Cleveland 14, O. Mr. Schweng, for the past four years economic specialist in the development department of General Aniline & Film Corp., New York, N. Y., will headquarter at Diamond Alkali's New York sales division at 570 Lexington Ave.

E. A. Norris, at one time factory manager of the Acushnet Process Co., New Bedford, Mass., has joined the Standard Products Co., Port Clinton, O., in a similar capacity.

Frank A. Seiberling, chairman of the Seiberling Rubber Co., Akron, O., on October 6 celebrated his eighty-ninth birthday. The dean of the rubber industry, however, has been mostly confined to his bed for the past several months.

Arthur J. Campbell has been made division manager of the industrial chemicals division of American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y. Mr. Campbell, formerly general sales manager of this division, has been with the company for many years and has a wide range of experience in all fields serviced by this division. Under his supervision the industrial chemicals division produces and sells synthetic organic chemicals, petroleum catalysts and additives, heavy chemicals, paper chemicals, organic acids and plasticizers, and other products widely used by industry.

Charles K. Novotny, formerly vice president of Lake Shore Tire & Rubber Co., Des Moines, Iowa, has transferred to Armstrong Rubber Co., West Haven, Conn., where he will be in charge of production at all plants in the Armstrong group, including Lake Shore.

C. E. Blanchard has been added to the staff of the Boston, Mass., office of J. O. Ross Engineering Corp., where he will continue in the work—design and sales of special drying equipment—in which he was engaged for the past two decades with B. F. Sturtevant Co.

Lansing T. Carpenter has been appointed director of advertising and public relations for The Russell Mfg. Co., Middletown, Conn., succeeding G. Norman Robinson, resigned. In this capacity Mr. Carpenter will have charge of advertising, sales promotion, and publicity. He previously had been general assistant director of public relations for United States Rubber Co.

J. E. Trainer, vice president in charge of production for The Firestone Tire & Rubber Co., Akron, O., is serving as chairman of the committee on engineering for President Truman's conference on industrial safety.

Arthur B. Van Buskirk, vice president and a member of the board of governors of T. Mellon & Sons, has been elected a director of Koppers Co., Inc., Pittsburgh 19, Pa., succeeding Donald D. Shepard, resigned.

Pierre S. du Pont, 3rd, last month was elected a director of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., to fill the vacancy created by the death of Elwyn Evans. Mr. du Pont, manager of rayon tire yarn sales, joined the company as a chemist in the experimental station at Wilmington in 1934 after graduation from Massachusetts Institute of Technology. Pierre du Pont, 3rd, is a son of Lamont du Pont, former chairman of the board, and is also a great-great grandson of the company's founder.

R. L. Lauffer has been appointed territory salesman for the northwest district for Pennsylvania Rubber Co., Jeannette, Pa. Mr. Lauffer, who will make his headquarters at Spokane, Wash., was branch service manager of Pennsylvania's Los Angeles office for the past two years.

Arthur W. Carpenter, manager of physical testing laboratories at the Akron plants of The B. F. Goodrich Co., has been loaned to the government for service on the National Security Resources Board and is in Washington, D. C. for three months. Mr. Carpenter, a former president of the American Society for Testing Materials, is widely known in that scientific field and held several important posts with the War Production Board during World War II.

W. M. Moser has joined Kirkhill Rubber Co., Los Angeles 37, Calif., as technical director, a position he had formerly held at Pharis Tire & Rubber Co.

James F. Fleming, with the company since 1941, has been appointed advertising manager of Brunswick-Balke-Collender Co., Chicago, Ill.

F. A. Maskell has been named sales representative of the New York Belting & Packing Co., Passaic, N. J., to cover Colorado, Utah, Arizona, and New Mexico, with headquarters in Salt Lake City.

Arthur Surkamp, treasurer of U. S. Rubber, has been elected a director of the Controllers Institute of America, New York. A member of the organization since 1942, Mr. Surkamp served as chairman of its admission committee in 1947-48.

Cecil A. Smith, since 1945 assistant district sales manager of The New Jersey Zinc Sales Co., 938 Guardian Bldg., Cleveland 14, O., on October 20 was made district sales manager. Mr. Smith joined the company in its sales engineering department at the New York, N. Y., office, 160 Front St., in 1919 and was transferred to Cleveland in 1930.

Robert Coleman, formerly with Pharis Tire & Rubber Co., has gone to W. J. Voit Rubber Corp., Los Angeles 11, Calif., as assistant chemist.

OBITUARY

Andrew L. Matelik

FUNERAL services were held for Andrew Lawrence Matelik, associated with Kirkhill Rubber Co., Los Angeles, Calif., on September 27 at St. Andrews' Church, Pasadena, following his death on September 24. Burial was in Calvary Cemetery, Los Angeles.

Born in Queens, N. Y., August 31, 1905, Mr. Matelik attended New York grammar and high schools and was graduated from Columbia University in 1927 with a B.S. degree in chemistry. In 1940 he became plant manager of Aetna Rubber Co., Cleveland, O. Remaining there until 1943, he next joined the Sierra Rubber Co., Los Angeles, also as plant manager. In 1946 he became a free-lance consulting technologist and remained as such until February, 1948, when he was employed by Kirkhill.

Mr. Matelik was a member of the Amer-

ican Chemical Society, Los Angeles Rubber Group, and the Kiwanis.

Surviving the deceased are his wife, his mother, a son, and a sister.

Reid L. Carr

REID LANGDON CARR, president and a director of the Columbian Carbon Co., New York, N. Y., died at his New York home on October 7 as the result of a heart attack. The deceased was also president and a director of six subsidiary companies of Columbian.

Born in Cornwall, Vt., October 20, 1880, Mr. Carr was graduated from Middlebury College in 1901 and the New York Law School in 1903 with a Bachelor of Laws degree. In that same year he became an instructor in the law school, a position which he retained until 1916. During that time, however, he also was a member of the law firms of Morgan & Seabury from 1905 to 1907, Morgan, Morgan & Carr from 1909 to 1921, and with Clark, Carr & Ellis, from 1921 until 1940. In 1938 he was elected vice president of Columbian Carbon Co. and in 1940 president of the company and all its subsidiaries. He had for many years been the counsel and secretary of the company.

Mr. Carr belonged to the State and City Bar associations, the State Chamber of Commerce, and the Society of Colonial Wars and was a director of the Irving Trust Co., the Frederick H. Levey Co., Appleton Century Crofts, the Interstate Natural Gas Co., the Mississippi River Fuel Co., the New York Institute for the Education of the Blind, and a trustee of Middlebury College.

Funeral services were held October 11 at his home, followed by burial, which took place privately at Ferncliff Mausoleum, Hartsdale, N. Y.

Surviving Mr. Carr is the widow.

John D. Fleming

JOHN D. FLEMING, 58, a member of the organic sales development department of Monsanto Chemical Co., St. Louis, Mo., died of a heart attack on October 12 at his home in St. Louis. A native of that city, Mr. Fleming was a graduate of Washington University, Class of 1913. He received his M.S. degree there the following year. The deceased served for some time as chief chemical engineer for the St. Louis Water Department. He had been with Monsanto since 1934.

Mr. Fleming is survived by his wife, a daughter, and two sons.

George I. Thomson

AS THE result of a heart attack suffered while on a business trip, George Irvine Thomson, controller of the Rubberset Co. of Canada, Ltd., Gravenhurst, Ont., died on September 22 at a Toronto hospital. The 45-year old executive came to Canada 25 years ago from his native England.

A former resident of Toronto, Mr. Thomson was the chief cost accountant for the John Inglis Co., Ltd., from 1940 to 1945.

Mr. Thomson is survived by his wife, his mother, two sisters, and six brothers.

FINANCIAL

S. S. White Dental Mfg. Co., Philadelphia, Pa., and subsidiaries. First six months: net profit, $627,362, equal to $2.09 each on 298,898 capital shares, contrasted with $633,434, or $2.11 each on 298,838 shares, in the corresponding months of 1947; net sales, $9,528,505, against $9,900,208.

Viceroy Mfg. Co., Ltd., Toronto, Ont., Canada. Year ended February 29, 1948: net profit, $132,368, equal to $1.12 each on 118,192 common shares, compared with $80,231, or 73¢ a share, in the preceding fiscal year.

Union Carbide & Carbon Corp., New York, N. Y., and subsidiaries. First three quarters, 1948: net income, $73,596,110, equal to $2.55 each on 28,807,314 capital shares, compared with $54,865,182, or $1.90 each on 9,479,788 shares in last year's period.

Union Asbestos & Rubber Co., Chicago, Ill. First six months: net profit, $767,226, equal to $1.55 a common share, against $447,303, or 90¢ a share in the '47 half; net sales, $6,853,272, against $4,055,763.

Thermoid Co., Trenton, N. J., and subsidiaries. Initial half, 1948: net profit, $570,065, equal to 70¢ each on 716,588 common shares, contrasted with $506,060, or 72¢ each on 602,464 shares, in the 1947 months; sales, $12,656,326, against $12,488,552; reserve for federal taxes, $353,461, against $395,534.

Seiberling Rubber Co., Akron, O. First half, 1948: net income, $299,731.51, equal to 59¢ a common share, contrasted with $162,663.08, or 13¢ a share, in the first half of last year; net sales, $14,138,711.96, against $15,546,719.31.

Rome Cable Corp., Rome, N. Y. Six months ended September 30: net profit, $508,938, equal to $1.23 a common share, against $554,263, or $1.35 a share, a year earlier.

Raybestos-Manhattan, Inc., Passaic, N. J., and domestic subsidiaries. First half: net profit, $1,135,456, equal to $1.80 each on 628,100 capital shares, compared with $1,124,260, or $1.79 a share, in last year's half; provision for federal taxes, $957,500, against $1,196,500.

Plymouth Rubber Co., Inc., Canton, Mass. Half year ended May 31: net profit, $155,981, equal to 17¢ each on 900,000 common shares, against $1,122,704, or $1.25 a share, in the corresponding period of 1947; net sales, $5,506,471, against $6,265,782.

Pharis Tire & Rubber Co., Newark, O. First half, 1948: net loss, $319,796, against net income of $322,516, or 76¢ each on 424,600 common shares, in the same period last year; net sales, $5,044,481, against $10,082,200.

Norwalk Tire & Rubber Co., Norwalk, Conn. Nine months ended June 30: net loss, $87,901, contrasted with net profit of $150,360, equal to 74¢ each on 202,230 capital shares, in the corresponding period a year earlier; net sales, $4,642,149, against $7,806,657.

National Lead Co., New York, N. Y. Half ended with June 30: net income, $6,512,990, equal to $1.77 a common share, against $6,479,049, or $1.76 a share, a year earlier; sales, $148,121,628, against $130,105,900.

Lea Fabrics, Inc., Newark, N. J. Year ended May 31, 1948: net income, $678,239, equal to $3.23 each on 209,820 capital shares, contrasted with $623,187, or $2.97 each on 104,921 shares, in the preceding fiscal year.

Koppers Co., Inc., Pittsburgh, Pa. First nine months, 1948: net income, $6,831,770, equal to $5.67 each on 1,125,825 common shares, contrasted with $4,788,826, or $3.89 each on 1,115,550 shares, in the 1947 months; net sales, $144,615,188, against $119,701,014.

Johns-Manville Corp., New York, N. Y., and subsidiaries. First three quarters, 1948: net earnings, $10,845,218, equal to $3.67 a common share, compared with $7,497,750, or $2.56 a share, in the corresponding period last year; net sales, $122,339,639, against $95,990,375.

Intercontinental Rubber Co., Inc., New York, N. Y., and subsidiaries. First six months, 1948 net loss, $122,708, compared with net loss of $12,973 in the '47 half; sales, $92,317, against $1,298,788.

Hercules Powder Co., Wilmington, Del. First nine months, 1948: net profit, $8,328,985, equal to $3.04 a common share, against $10,057,668, or $3.69 a share, in the 1947 months; net sales, $97,510,923, against $98,969,964.

General Electric Co., Schenectady, N. Y., and consolidated affiliates. Nine month ended September 30: net income, $83,893,459, equal to $2.91 each on 28,845,927 common shares, contrasted with $62,466,626, or $2.17 a share, in the like period last year; net sales, $1,137,935,052, against $921,221,142; reserve for federal income taxes, $60,000,000, against $41,383,698; provision for postwar adjustments and contingencies, $0, against $3,750,000.

Denman Tire & Rubber Co., Warren, O. First half, 1948: net profit, $108,156, equal to 49¢ each on 195,075 common shares, against $115,857, or 53¢ a share, in last year's half; net sales, $1,157,484, against $1,901,684.

Brunswick-Balke-Collender Co., Chicago, Ill., and subsidiaries. Nine months ended September 30: net profit, $1,758,884, equal to $3.69 a common share, compared with $1,067,881, or $2.15 a share, in the corresponding period last year; consolidated net sales, $23,096,953, against $20,996,760.

(Continued on page 274)

Patents and Trade Marks

APPLICATION

United States

2,448,654. **Convertible Top for Automobiles, Etc., Including an Inflatable Roof Formed by an Airtight Bag of Elastic Material.** F. W. Seckel, New York, N. Y.

2,448,189. **Nursing Bottle Holder, Including an Elastic Planar Membrane and Reinforcing Means for This Membrane.** C. W. Mott, La Grange, assignor to F. M. Muench, Wilmette, both in Ill.

2,448,222. **In a Global Wheel Including Connected Hubs, Inflatable Tires Mounted on the Hubs; Each Tire Is Semispherical in Outer Conformation, and Interiorly Formed to Conform to the Tapered Surface of the Body Portion of the Hub on Which It Is Mounted.** C. Y. Jones, Carlisle, Pa.

2,448,242. **Bobbin Molded from Cellulose Aceto-Butyrate.** P. B. Wilson, assignor to H. D. Wolgamot, both of Portland, Oreg.

2,448,248. **Rubber Wheel.** J. B. Bennett, Los Angeles, and J. McCarter, Alhambra, both in Calif., assignors, by mesne assignments, to Thermold Co., a corporation of Del.

2,448,269. **In a Balloon Suspension Patch, Including a T-shaped Metal Member, Rubberized Tapes Supporting the T-member.** O. W. Loudenslager, R. C. Gardner, and F. E. Ensley, assignors to Goodyear Aircraft Corp., all of Akron, O.

2,448,281. **Vibration Dampener.** C. Saurer, Cleveland, assignor to Ohio Rubber Co., Willoughby, both in O.

2,448,313. **Resilient Automobile Tire.** C. Hughes, Forest, Tex.

2,448,357. **Resin-Bonded and Surfaced Panel Facing.** K. A. Craig and R. J. Auchter, Appleton, assignors to Paper Patents Co., Neenah, both in Wis.

2,448,455. **Laminated, Rubber-Impregnated Pile-Fabric Shoe Sole.** A. E. Murray, Wilmington, Del.

2,448,485. **Lined Metallic Spiral Hose.** A. E. Chernack, Elmwood, Conn.; M. Chernack, executrix of A. E. Chernack, deceased.

2,448,513. **Electrostatic Condenser Plate, Including a Piece of Aluminum Having a Porous and Absorbent Coating Produced by Electrolysis in an Aqueous Solution of a Film Forming Material and a Potential Condensation Product of Urea and Formaldehyde; This Coating Is Impregnated with a Dielectric Material Which Fills the Pores and Penetrates to the Metal to Which It Is thus Keyed.** J. B. Brennan, Bratenahl, and L. M. Conrad, Cleveland, both in O.; Conrad assignor to Brennan.

2,448,524. **Coated Granular Polyvinyl Acetate.** E. J. Gentner, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,448,536-537. **Wheel Cover.** G. A. Lyon, Allenhurst, N. J.

2,448,569. **Nursing Unit, Including a Reusable Collar and Nipple and a Disposable Body.** A. M. Allen, Arlington, Va., assignor to Disposable Bottle Corp., Washington, D. C.

2,448,693. **Device for Pneumatically Eviscerating Poultry Carcasses.** R. D. Trelease and C. H. Koonz, assignors to Swift & Co., all of Chicago, Ill.

2,448,724. **Nasal Filter of Molded Flexible Elastic Oil-Insoluble Synthetic Rubber.** C. L. McGovney, Elizabeth, N. J.

2,448,786. **In a Machine for Forming Confections, an Endless Belt Having on Its Exterior Face a Series of Bottom-Vented Cup-Like Depressions and a Resilient Membrane Enclosing the Belt; Negative Pressure through the Vents Forms Cups in the Membrane for Holding Confection Material.** C. E. Faxon, Republic, Wash.

2,448,928. **In a Rug, a Loop Pile Held to the Fabric Base by Stitching Threads Covered with a Resilient Material Which Yields When the Loops Are Pulled.** W. F. Stahl, Kenilworth, assignor, by direct and mesne assignments, to Libertyville Textiles, Inc., Libertyville, both in Ill.

2,449,115. **Hosiery Protector of Flexible, Waterproof Material.** F. L. Harriman, Lansing, Mich.

2,449,147. **Toy, Including a Rubber Balloon Provided with a Fluid Inlet Member and Designed to Be Self-Disengaging from a Tubular Inflating Device.** L. W. Samuels, Allentown, Pa.

2,449,405. **An Air-Jet Propelled Top, Including an Elastic Inflatable Bag Having on Its Underside a Tubular Neck to Which Is Connected a Peg on Which the Bag Turns.** J. R. Mordan, Alden, N. Y.

2,449,409. **A Protective Stocking of Elastic Mesh Fabric Woven to Provide a Pocket at the Knee Joint to Hold a Protective Pad of Rubber-Like Material on the Leg of a Horse.** J. Polinsky, Cleveland, O.

2,449,421. **Track for Self-Laying Track-Type Vehicles.** C. O. Slemmons, Akron, and R. W. Smith, Copley, both in O., assignors to B. F. Goodrich Co., New York, N. Y.

2,449,425. **Garter, Including a Flexible Resilient Band on Which Are Mounted Arches of Relatively Rigid Material.** P. J. Stieger, St. Paul, Minn.

2,449,428. **Die Assembly and Rubber Insert for Flanging Sheet Metal.** A. A. Timmons, assignor of 98% to W. Timmons, both of McKinney, Tex.

2,449,461. **Tire Curing Bag of Rubber Compounded with Acetylene Carbon Black.** D. R. Elliott and K. K. Madison, both of Detroit, Mich., assignors to United States Rubber Co. New York, N. Y.

2,449,514. **Oil-Well Packer, Including an Expansible Tubular Body of Elastic Material.** W. E. Scoville, Jr., Nutley, N. J., assignor to United States Rubber Co., New York, N. Y.

2,449,526. **The Use of an Expansible Membrane in Forming an Integral Molded Seamless Plywood Tubing.** J. J. Dunne, Westport, Conn., and O. S. Tuttle, New Rochelle, assignors to United States Plywood Corp., New York, both in N. Y.

2,449,534. **In a Method of Forming Permanent Creases in Wearing Apparel, a Thermoplastic Coated Strip of Material Secured to the Inner Surface of the Fabric Where the Crease is to Be Formed.** H. Meyer, Richmond, England.

2,449,606. **For a Tire Repair Vulcanizer, a Flexible Cover, Including a Rubber Body and a Steel Wire Reinforcing Cable in the Body, Extending Back and Forth in a Series of Convolutions from One End to the Other.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,494,654. **In a Shaft Coupling Including a Pair of Recessed Flanges, Correspondingly Shaped Resilient Pads Fitting Snugly in the Recesses.** R. E. E. Jessop, West Vancouver, B. C., Canada.

2,449,935. **An Inflatable Toy Simulating a Football Dummy.** M. J. Gilman, Gilman, Conn.

2,449,936. **Foot Wrapper, Including a Water Impervious Sole Member and an Upper Member of Light, Flexible, Moisture-Resistant Material Secured to the Sole Member.** F. K. Glasgow, Long Beach, assignor of 40% to H. H. Jamieson, Los Angeles, both in Calif.

2,449,941. **An Egg Shell Remover, Including Tongs, Shell-Breaking Prongs, a Hollow Egg-Piercing Spear, a Resilient Bulb Connected to the Spear by a Tube, and a Cup-shaped Member of Flexible Material Surrounding the Spear.** D. Jaujiainen, Iron River, Mich.

Dominion of Canada

450,640. **In a Valve Closure, a Movable Valve Member, Having a Facing of Readily Deformable Elastic Material.** J. L. Gratzmuller, Paris, Seine, France.

450,709. **Brake Apparatus for a Vehicle Wheel, Which Includes an Annular Member for Location of Brake Shoes, Hydraulic Packing in a Channeled Recess of This Member, Thrust Members Continuous to the Hydraulic Packing, and between Thrust Members and Brake Shoes a Distensible Tube of Resilient Material Having an Inlet Pipe.** H. Trevaskis, Coventry, assignor to Dunlop Rubber Co., Ltd., London, both in England.

450,717. **Shock Absorbing Device.** E. P. Neher, North Manchester, Ind., assignor to General Tire & Rubber Co., Akron, O., both in the U.S.A.

450,718. **For Treating Material on the Leading Edge of a Propeller Blade, Apparatus Including an Inflatable Element U-Shaped in Cross-Section.** J. O. Antonson, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,757. **High-Frequency Electrode, Including Conductive Material Partially Embedded in Insulation and Having a Covering Made of a Dielectric Having a Higher Dielectric Constant Than the First-Named Insulation.** G. T. Hart, Lynn, Mass., U.S.A., assignor to United Shoe Machinery Co. of Canada, Ltd., Montreal, P.Q.

450,806. **Apparatus to Transmit the Heat of Oral Respiration to Other Parts of the Human Body, Including a Forked Hard Rubber Member, a Valve for Maintaining Heat and Pressure within the Apparatus, Two Rubber Tubes Attached to the Forked Member and Conducting the Heat to an Inverted Saucer-Shaped Hard Rubber Member Which Transmits the Heat to Other Parts of the Body.** E. L. Lessard, Sherbrooke, P.Q.

450,822. **In an Instrument Panel Mount, a Cushioning Pad of Elastic Spongy Material.** C. S. Robinson, Ridgewood, N. Y., U.S.A.

450,860-862. **Gas Filled Cable.** G. B. Shanklin, Schenectady, N. Y., U.S.A., assignor to Canadian General Electric Co., Ltd., Toronto.

450,870-871. **Textile Loom Picker of Rubberized Fabric.** H. M. Bacon, assignor to Dayton Rubber Co. (formerly Dayton Rubber Mfg. Co.), both of Dayton, O.

450,876. **Compsible Fuel Tank.** M. M. Cunningham and G. P. McDowell, South Bend, Ind., U.S.A., assignors to Dominion Rubber Co., Ltd., Montreal, P.Q.

450,882. **Tubeless Tire.** R. W. Brown, assignor to Firestone Tire & Rubber Co., both of Akron, O., U.S.A.

450,930. **Soft Rubber Plug in a Medicament Cartridge or Vial.** S. D. Goldberg, Queens, L. I., assignor to Oradent Chemical Co., Inc., New York, both in N. Y., U.S.A.

450,944 **Leather, Hides, and Skins Having Incorporated therein Solid Waxy Polyethylene Resin Composition.** J. Pomeraniec and F. Uhlfelder, assignor to Tanoplastics Research, Ltd., all of London, England.

450,968. **Gasoline Container, Including a Barrier of a Woven Fabric of Cold-Drawn Polyamide Fiber Impregnated with a Polyamide Interpolymer.** C. W. Taylor, assignor to Wingfoot Corp., both of Akron, O., U.S.A.

450,970. **Earpiece of Soft Resilient Material.** E. L. Kelsey, assignor to Zenith Radio Corp., both of Chicago, Ill., U.S.A.

450,991. **Roller Skate Wheel, Including a Cylindrical Rubber Sleeve in Which Bearing Cups Are Mounted.** W. Freeborn, Weston, Ont.

450,994. **In a Hydrotherapeutic Apparatus, Including a Spray in a Cup-Shaped Envelope, an Elastic Border for The Envelope.** M. and F. M. Grenier, both of Montreal, P.Q.

451,003. **Deep Water Waders.** H. A. Ritchie, Glasgow, Scotland.

451,044. **Plastic-Insulated Cable.** A. King, assignor to British Insulated Callender's Cables, Ltd., both of London, England.

451,097. **Resin Bonded Abrasive.** L. Coes, Jr., Brookfield, assignor to Norton Co., Worcester, both in Mass., U.S.A.

451,164. **Tieproof Laces, Including a Section of a Continuous Band of a Plastic Material Having an Elastic Stretchability of 5% to 100%.** A. Reiter, New York, N. Y., U.S.A.

451,196. **Insulated Electrical Conductor Comprising a Wrapping of Glass Fibers Bonded to the Conductor by Coatings of Synthetic Resin Compositions.** J. J. Keyes, Pittsburgh, Pa., U.S.A., assignor to Canadian Westinghouse Co., Ltd., Hamilton, Ont.

451,235. **Breast Massager.** L. A. Marc-Aurele, assignor to Neo Beauty Line Co., Ltd., both of Montreal, P.Q.

451,275. **Surface Fiber Board With a Hard Surface of Polymerized Thermosetting Resin and a Graded Penetration of the Resin into the Substance of the Board.** R. C. Campbell, Sranmore, Middlesex, and D. Campbell, New Barnet, Hertfordshire, both in England.

451,320. **In a Pipe Joint, a Flexible Membrane Having a Convex Sealing Face of Butyl Rubber.** E. A. Wahl, Elmhurst, assignor to General Chemical Co., which has been merged into Allied Chemical & Dye Corp., New York, both in N. Y., U.S.A.

451,391. **Unitary Composite Separator for Storage Batteries, Including a Relatively Thin and Microporous Mat of Fine Synthetic Resin Filaments Inert to Battery Electrolyte Covered by One or More Relatively Thick Microporous Mats of Material also Inert to Battery Electrolyte.** L. E. Wells, Cleveland Heights, assignor to Willard Storage Battery Co., Cleveland, both in O., U.S.A.

United Kingdom

605,866. **Sizing with Synthetic Resin Compositions.** F. Kiviat.

605,990. **Deicing Apparatus for Aircraft.** Bendix Aviation Corp.

606,135. **Soles and Heels for Attachment to Boots and Shoes.** Hertfordshire Rubber Co., Ltd., and H. Kassner.

606,146. **Pneumatic Springing and Damping Arrangement for Vehicles.** F. A. Wettstein.

606,175. **Bathing Caps.** Hungarian Rubber Goods Factory.

606,219. **Coaxial Electric Cables.** Campagnie Generale D'Electricite.

606,222. **Synthetic Resinous Laminated Articles Having Craze Resistant Coatings.** British Industrial Plastics, Ltd.

606,237. **Electric Cable.** Standard Telephones & Cables, Ltd.

606,645. **Anti-Vibration Mountings.** G. V. Elphick and R. H. Corfield.

606,555. **Vibration Damping Mountings for Optical Observation Instruments.** Barr & Stroud, Ltd., Sir J. W. French, J. M. Strang, and C. D. Macgill.

606,581. **Joints or Couplings.** Rubber Bonders, Ltd., and R. Boole.

606,752. **Electric Cables.** R. C. Mildner.

606,834. **Inner Tubes.** D. J. Chappell.

606,888. **Printers' Blankets.** R. Hoe & Co., Ltd., Andre Rubber Co., Ltd., and J. O. Crabtree.

607,041. **Heel Protector for Footwear.** G. Leganger-Krogstad.

607,224. **Pressure - Sensitive Adhesives.** Johnson & Johnson (Great Britain), Ltd.

607,354. **Pneumatic Tired Wheels.** Australian Steel Split Pulleys Pty., Ltd

607,374. **Deicing Equipment for Aircraft.** Soc. Anon. Belge de Constructions Aeronautiques S.A.B.C.A. and H. Cornelius.

607,640. **Resilient or Shock Absorbing Wheels.** A. Wiseman & Co., Ltd., and H. G. White.

607,651. **Electrical Insulated Cable.** A. H. Bebb and J. Buckingham.

607,836. **Bathing Helmet.** N. and A. Marcus.

PROCESS

United States

2,448,112. **Method of Attaching Soles to the Bottoms of Welt Shoes Wherein the Attaching Faces of the Sole and the Welt Are of Thermoplastic Material.** F. V. Nugent, Abington, Mass., assignor to United Shoe Machinery Corp., Flemington, N. J.

2,448,173. **Forming an Article from a Plurality of Parts Constructed from Thin Synthetic Plastic Sheet Material.** P. V. Cowan, Chicago, Ill.

2,448,280. **Cellular Insulating Mass.** E. L. Sargent and R. C. Wilson, Jr., both of Woodbury, N. J., assignors to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

2,448,432. **Wrinkle-Free Vinylidene Chloride Polymer Film.** C. R. Irons and C. E. Sanford, assignors to Dow Chemical Co., all of Midland, Mich.

2,448,676. **Injection Molding Plastic Material.** H. F. MacMillin and G. A. Waldie, Mount Gilead, O., assignors to H-P-M Development Corp., a corporation of Del.

2,449,356. **Shielded Ignition Leads.** H. M. Wilkoff, New York, N. Y.

2,449,390. **Hard Rubber.** R. A. Kirby, assignor to Expanded Rubber Co., Ltd., both of Croydon, England.

Dominion of Canada

450,894. **Coating a Textile Fabric with Plasticized Vinyl Resin.** G. W. Flanagan, Shaker Heights, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,942. **Hollow Rubber Articles.** D. C. Kempthorn, Akron, assignor to Sun Rubber Co., Barberton, both in O., U.S.A.

450,952. **Forming an Insulated Conductor Having Layers of Vulcanized Rubber and Fabric Impregnated with Ester Gum Saturants.** S. E. Brillhart, Lutherville, and A. N. Gray, Joppa, both in Md., assignors to Western Electric Co., Inc., New York, N. Y., both in the U.S.A.

450,967. **Removing a Volatile Material from Latex.** J. B. Mitchelson, Cuyahoga Falls, and H. P. Roberts, assignors to Wingfoot Corp., both of Akron, both in O., U.S.A.

451,042. **Thermoplastic Sheet Material.** J. M. Bierer, Waban, assignor to Boston Woven Hose & Rubber Co., Cambridge, both in Mass., U.S.A.

451,055. **Moldable Plastics Compositions.** A. W. Koon, assignor to Columbian Rope Co., both of Auburn, N. Y., U.S.A.

451,116. **Coating or Impregnating Articles with Sulfur and Any Synthetic Resin, Synthetic Rubber, or Other Suitable Material.** C. F. Lumb, assignor to Schori Metallizing Process, Ltd., both of London, England.

451,125. **Joining Thermoplastic Materials.** G. Lindh and W. M. Phillips, Jr., assignors to Udylite Corp., all of Detroit, Mich., U.S.A.

United Kingdom

606,169. **Molding Microporous Bodies from Thermosetting Resins.** National Cash Register Co.

606,259. **Injection Molding of Resinous Compositions.** British Resin Products, Ltd., and D. N. Davies.

606,384. **Molded Resins.** Lonza Electric & Chemical Works, Ltd.

606,513. **Impregnated Fabrics.** Ets. Colmant & Cuvelier, S. A.

606,697. **Resin-coated Articles.** Shell Development Co.

606,705. **Highly Polished Polyvinyl Chloride Sheets and Coated Fabrics.** Imperial Chemical Industries, Ltd., and W. L. Brogan.

606,880. **Extruded Thermoplastic Articles.** C. E. Slaughter.

606,936. **Molding Polyvinyl Chloride Pastes.** B. X. Plastics, Ltd., and J. A. Hetherington.

607,548. **Hot Water Bottles.** W. Harrison.

607,546. **Treating Rubber Articles.** Dunlop Rubber Co., Ltd., F. A. Jones, and D. F. Twiss.

607,573. **Artificial Sponges from Viscose.** Soc. de la Viscose Française.

607,690. **Heating Compositions by High-Frequency Alternating Electric Currents.** Dunlop Rubber Co., Ltd., and P. H. Amphlett.

607,755-756. **Molded Synthetic Resin Articles.** N. V. de Bataafsche Petroleum Mij.

607,804. **Tire Repairing.** Dunlop Rubber Co., Ltd., and E. F. Powell.

607,828. **Plastic Rivets.** United States Rubber Co.

CHEMICAL

United States

2,448,029. **Preparing an Ion Exchange Agent by Reacting Phenol Sulfonic Acid with Formaldehyde in the Presence of Water.** G. B. Heusted and W. C. Baumann, assignors to Dow Chemical Co., all of Midland, Mich.

2,448,053. **Reacting a Low-Boiling Conjugated Diene with Sulfur Dioxide to Form a Less Volatile Decomposable Sulfone.** F. W. Rose, Jr., Media, Pa., assignor to Houdry Process Corp., Wilmington, Del.

2,448,082. **Recovery of Water-Soluble Cellulose Esters.** R. M. Creamer, Cumberland, Md., assignor to Celanese Corp. of America, a corporation of Del.

2,448,110. **Preparing Vinyl Chloride by Reacting Acetylene and Hydrogen Chloride in the Presence of a Heated Catalyst Consisting Essentially of Mercuric Chloride and Thorium Chloride on a Porous Carrier.** H. S. Miller, Stamford, Conn., assignor to Air Reduction Co., Inc., New York, N. Y.

2,448,127. **Removing the Combined Halogen from a Polymer of the Class of Polyindene Polycoumarone and Polystyrene Prepared by the Action of a Friedel-Crafts-Type Catalyst on a Solution of the Monomer.** H. M. Stanley, Tadworth, F. E. Salt, Banstead, and J. F. Williams, Tunbridge Wells, all in England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

2,448,154. **Mixing a Symmetrical Xenyltriazene with an Organoplastic Material to Produce a Gas Expanded Organic Plastic.** H. H. Richmond, Guelph, Ont., and M. Tomiuk, Stratmore, P.Q., both in Canada, assignors to United States Rubber Co., New York, N. Y.

2,448,155. **As a New Compound, 1,3-Bis (O-Xenyl)-Triazene.** H. H. Richmond, Guelph, Ont., Canada, assignor to United States Rubber Co., New York, N. Y.

2,448,211. **Synthesizing the Homologs of Thiophene.** P. D. Caesar, Wenonah, and A. N. Sachanen, Woodbury, both in N. J., assignors to Socony-Vacuum Oil Co., Inc., a corporation of N. Y.

2,448,246. **Vinyl Alloxy Acetate.** R. S. Barker, Oakland, and L. N. Whitehill, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,448,258. **Convertible Alkyd Resin.** T. W. Evans, Oakland, and D. E. Adelson, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,448,259. **Polymerizable Ester of an Alcohol Having an Aliphatic Multiple Linkage between Two Carbon Atoms and Trimethyladipic Acid Wherein the Methyl Groups Are Substituted on the Alpha and Gamma Carbon Atoms.** H. de V. Finch, El Cerrito, assignor to Shell Development Co., San Francisco, both in Calif.

2,448,260. **Reacting Polyvinyl Alcohol with Dihydropyran in the Presence of an Acid Catalyst.** N. W. Flodin, Niagara Falls, N. Y., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,448,358. **Extrudable Composition, Including Polyvinyl Alcohol, Polyhydric Alcohol Plasticizer, and Phthalic Anhydride.** C. Dangelmajer, Nutley, N. J., assignor to Resistoflex Corp., Belleville, N. J.

2,448,391. **Interpolymer of Styrene and Tetraallylsilane.** J. J. Pyle, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,448,530. **Solid, Elastic, Curable Methylpolysiloxane Obtained by Condensing a Liquid Consisting of Polymeric Dimethylsiloxane Containing up to 2 Mol % Copolymerized Monomethylsiloxane, a Substance of the Class of Mercury, Mercury Oxide and Mercury Salts, and a Peroxide Cure Accelerator.** H. F. Jones, Pittsfield, Mass., assignor to General Electric Co., a corporation of N. Y.

2,448,531. **Resinous Copolymer of Isopropenyl Acetate and an Ester from the Group of an Ester of a Monhydric Alcohol and Maleic Acid and an Ester of Monhydric Alcohol and Fumaric Acid.** W. O. Kenyon and C. C. Unruh, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,448,556. **Solid, Elastic Curable Polysiloxane.** M. M. Sprung, Scotia, and C. A. Burkhard, Alplaus, both in N. Y., assignor to General Electric Co., a corporation of N. Y.

2,448,565. **Solid Elastic Curable Methylpolysiloxane.** J. G. E. Wright, Alplaus, and C. S. Oliver, Schenectady, both in N. Y., assignors to General Electric Co., Schenectady, N. Y.

2,448,566. **Obtaining Dipentaerythritol from Mixtures Containing It.** J. A. Wyler, assignor to Trojan Powder Co., both of Allentown, Pa.

2,448,572. **Polymer Composition Including a Finely Divided Alkaline Carbonate Intimately Mixed with an Acyl Peroxide Cured Polyester.** B. S. Biggs, Summit, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

2,448,584. **Cured Synthetic Elastomer Obtained by Curing with Benzoyl Peroxide, a Viscous Gummy 2,3 Dihydroxybutane-Dicarboxyhydrocarbon Polyester.** C. J. Frosch, Chatham, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

2,448,585. **Cured Synthetic Rubber Obtained by Heating with Benzoyl Peroxide a Fusible Polyester Prepared by Esterification of a Mixture of a Dihydroxy Straight-Chain Alkane and Isopropylene Glycol together with a Mixture of Dicarboxylic Acids Consisting of Sebacic Acid and Maleic Acid.** C. S. Fuller, Chatham, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

2,448,609. **Composition Including an Organic Peroxide Cured Glycol-Dicarboxylic Acid Polyester Intimately Mixed with a Finely Divided, Pure Red Oxide of Iron.** F. S. Malm, Millburn, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

2,448,621. **Resinous Materials from Tall Oil.** W. J. Rice, Brooklyn, N. Y.

2,448,638. **Adhesive Composition, Including a Condensation Product of Melamine and Aqueous Formaldehyde Added to an Aqueous Water Organic Solvent Solution of a Partially Hydrolyzed Homopolymer of Vinyl Acetate.** T. F. Murray, Jr., and G. F. Sharrard, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,448,660. **Preparing Ether Acetals by Reacting in the Presence of a Mercury Catalyst and a Strongly Acidic Catalyst, a Vinyl Ester of a Saturated Monocarboxylic Acid and an Ether Alcohol.** W. J. Croxall, Bryn Athyn, and H. T. Neher, Bristol, assignors to Rohm & Haas Co., Philadelphia, all in Pa.

2,448,664. **Polyoxypropylene Compounds.** H. R. Fife, Mount Lebanon, Pa., and F. H. Roberts, Charleston, W. Va., assignors to Carbide & Carbon Chemicals Corp., a corporation of N. Y.

2,448,666. **For an Article Having an at Least Semi-Rigid Surface, a Coating Composed of a Mixture of a Polyvinyl Acetal Resin and Polyethylene.** D. A. Fletcher, Pompton Plains, and M. M. Renfrew, Arlington, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,448,703. **Copolymer Including 2-Chloroallyl Propionate Interpolymerized with Butadiene-1,3.** A. M. Clifford, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,448,714. **Dithio Acid Derivatives.** A. F. Hardman, assignor to Wingfoot Corp., both of Akron, O.

2,448,755. **Preparing 1,4-Dicyano Butene-2 from Corresponding Halogen Compounds.** C. N. Zellner, Elizabeth, assignor to Tide Water Associated Oil Co., Bayonne, both in N. J.

2,448,756. **Methyl Siloxane Elastomers.** M. C. Agens, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,448,799. **Plastic Composition, Including a Mixture of Polythene, a Microcrystalline Hydrocarbon Wax, and a Metal Salt of a Long Chain Fatty Acid.** W. B. Happoldt, Jr., Arlington, and A. Stockfleth, North Arlington, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,448,809. **Preparing Homogeneous, Partially Chlorinated Derivatives of Natural Rubbers, Balata, and Gutta Percha.** C. Koningsberger, Delft, assignor to Rubber Stichting, Amsterdam, both in Netherlands.

2,448,282. **Photopolymerization of an Ethylenically Unsaturated Organic Compound Containing, as a Photopolymerizable Catalyst, an Acyloin Ether.** M. M. Renfrew, Arlington, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,448,873. **Cellulose Compound Plasticized with Phenoxyethyl Lactate.** M. L. Fein, Riverside, N. J., and C. H. Fisher, Abington, Pa., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,448,890. **Condensation Products of Polyhydroxy Alkylamines with Aldehydes.** W. B. Johnston, Stamford, Conn., assignor to American Cyanamid Co., New York, N. Y.

2,448,946. **Insolubilizing Hydrolyzed Ethylene Vinyl Ester Polymers by Blending with a Compound from the Group of Acyl Peroxides and Inorganic Peroxides, and Heating.** W. L. Alderson, Jr., assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,448,952. **Dispersions of Polytetrafluoroethylene-Ethylene Copolymers.** K. L. Berry, Hockessin, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, both in Del.

2,448,958. **Diketo Acrylates.** A. M. Clifford, Stow, assignor to Wingfoot Corp., Akron, both in O.

2,448,971. **Extraction of Butadiene from a Hydrocarbon Mixture Containing Butadiene and Butene.** R. A. Given, Lake Charles, La., and W. S. Craft, Elizabeth, N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,448,976. **Polymerizing an Alpha Alkyl Styrene by Contacting with a Hydrogenating Catalyst and an Alkali Metal Hydocarbon Compound at between 50 and 500° F. and a Pressure between 500 and 2,000 pounds per Square Inch in the Pressure of an Inert Solvent.** R. G. Heiligmann, Yeadon, assignor to Atlantic Refining Co., Philadelphia, both in Pa.

2,448,978. **Mixture of Hydrolyzed Ethylene-Vinyl Ester Copolymer and N-Substituted Polyamide.** F. W. Hoover, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,448,979. **Process Which Includes Reacting Two Mols of Acrylonitrile with One Mol of Water in the Presence of an Alkaline Catalyst.** H. Hopff and W. Rapp, Ludwigshafen-on-Rhine, Germany; vested in the Attorney General of the United States.

2,448,985. **In the Manufacture of an Abrasive Product, Preparation of a Bond by Mixing a Phenol-Aldehyde Resin Component in the Liquid State with a Synthetic Rubber, which Is Dissolved and Swelled by the Liquid Resin.** J. N. Kuzmick, Clifton, and De W. Bell, Fair Lawn, assignors to Raybestos-Manhattan, Inc., Passaic, all in N. J.

2,449,001. **1,3-Diols.** L. A. Mikeska and E. Arundale, both of Westfield, N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,449,004. **Producing an Alpha Methyl Styrene by Contacting a Mixture of an Isopropyl Benzene and Steam with a Dehydrogenation Catalyst, which Consists of Magnesium, Iron, Copper, and Potassium Oxide.** C. E. Morrell, Westfield, and O. C. Slotterbeck, Rahway, both in N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,449,036. **Manufacture of Hexamethylenediamine by Liquid Phase Catalytic Hydrogenation of Adipic Nitrile.** M. Grunfeld, Lyon, France; vested in the Attorney General of the United States.

2,449,040. **Hexamethylene Tetramine.** P. Schideler, New York, N. Y., and C. P. Davis, Stamford, Conn., assignors to Chemical Construction Corp., New York, N. Y.

2,449,058. **Method of Curing Butadiene-Acrylic Nitrile Copolymer in Which the Combination of an Ester and an Acid Catalyst Is the Sole Curing Agent.** L. Coes, Jr., Brookfield, assignor to Norton Co., Worcester, both in Mass.

2,449,162. **Cyclic Lactones.** H. G. Dickenson, Warrington, assignor to Ward, Blenkinsop & Co., Ltd., London, both in England.

2,449,163. **Beta-Halogenopropionic Acids.** T. A. Ford, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,449,180. **Composition Including a Blend of a Phenol-Rubber and a Heat-Convertible Resorcinol-Formaldehyde Resol.** H. E. Schroeder, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,449,233. **Preparation of Fluorchlorocyclopentenes Having Eight Halogen Atoms Including a Chlorine Atom Attached to Each Olefinic Carbon.** A. D. Kischitz, C. I. Gochenour, and R. E. Brailsford, assignors to Hooker Electrochemical Co., all of Niagara Falls, N. Y.

2,449,299. **In a Method of Controlling the Oil Phase Gelling and Polymerizaton of a Mix Including a Polyhydric Alcohol Ester of Alpha-Olefinic Dicarboxylic Acid and an Ethylenic Monomer, in the Presence of a Peroxy Polymerization Catalyst, the Improvement of Adding, as Promoter of Gelation, a Secondary Monoamine.** E. C. Hurdis, Passaic, N. J., assignor to United States Rubber Co., New York, N. Y.

2,449,418. **Composition Including a Rubbery Diolefin Polymer and from 0.5 to 10% by Weight of the Polymer of an Aliphatic Alpha-(Acylthio)Carboxylic Acid.** W. H. Sharkey, assignor to E. I. du Pont de Nemours & Co Inc., both of Wilmington, Del.

2,449,447. **An Ester of a 3,4-Dialkoxybutyric Acid.** R. E. Brooks, assignor to E. I. du Pont de Nemours & Co. Inc., both of Wilmington, Del

2,449,469. **Preparation of Polyformals.** W. F. Gresham, Lindamere, and R. E. Brooks, Edgemoor Terrace, assignors to E. I. du Pont de Nemours & Co. Inc., Wilmington, all in Del.

2,449,470. **Synthesis of 1,1,2-Trialkoxyethanes.** W. F. Gresham and R. E. Brooks, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,449,471. **A 3,3-Dialkoxy Propionic Acid Ester.** W. F. Gresham, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,449,489. **Continuous Two-Step Process for the Direct Preparation of Polymer-from-Ethylene Emulsions.** A. T. Larson, assignor to E. I. du Pont de Nemours Co., Inc., both of Wilmington, Del.

2,449,520. **Resinous Reaction Product of 3,5-Diamino-4-Hydro-Thiotriazine-1-Dioxide and an Aldehyde.** H. A. Walter, Longmeadow, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,449,527-528. **Polymers and Copolymers of Monovinylphenoxthine.** R. G. and L. W. Flowers, both of Pittsfield, Mass., assignors to General Electric Co., a corporation of N. Y.

2,449,572. **Composition Including a Heat-Hardenable Hydrocarbon-Polysiloxane Resin and, as a Curing Catalyst, a Metal Salt of an Organic Acid Soluble in the Resin.** C. E. Welsh, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,449,612. **Synthetic Rubber Obtained by Heating a Mixture Containing an Alkyl Acrylate and an Ester of an Alkenyl Lactate and a Polybasic Carboxylic Acid, and Adding to the Resulting Copolymer Sulfur or Benzoyl Peroxide as Curing Agent.** W. C. Mast, Philadelphia, C. E. Rehberg, Glenside, and C. H. Fisher, Abington, all in Pa., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,449,613. **Improving Vegetable Oil Modified Alkyl Resins Containing Groups Containing Active Hydrogen by Reacting with Silicon Tetraisocyanate.** H. C. Miller, Claymont, and B. C. Pratt, assignors to E. I. du Pont de Nemours Co., Inc., both of Wilmington, Del.

2,449,643. **Benzonitrile (from Benzene or Diphenyl and HCN.** J. N. Cosby, Morristown, N. J., assignor to Allied Chemical & Dye Corp., New York, N. Y.

2,449,644. **Production of an Aryl Alkyl Amine by Reacting Styrene with Dibutylamine in the Presence of a Catalyst Including the Reaction Product of Metallic Sodium with Dibutylamine.** J. D. Danforth, Riverside, assignor to Universal Oil Products Co., Chicago, both in Ill.

2,449,684. **Aqueous Polyvinyl Chloride/Polystyrene Dispersions Suitable for Use in the Production of Dipped Articles.** R. G. R. Bacon, H. Taylor, and L. Wood, all of Blackley, assignors to Imperial Chemical Industries, Ltd., London, both in England.

2,449,724. **A Thiocyanate Salt of an Amidine.** W. F. Short and M. W. Partridge, both of Nottingham, England.

2,449,804. **An Aliphatic Nitroalcohol Ester of Acrylic Acid.** G. F. D'Alelio, Northampton, and J. W. Underwood, Pittsfield, both in Mass., assignors to General Electric Co., a corporation of N. Y.

2,449,815. **Resolution of Azeotropic Mixtures of Chlorosilanes.** A. E. Newkirk, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,449,816. **Plastic Material Including Organic Solvent-Soluble Allyl Starch Compounded and Cured with Sulfur.** P. L. Nichols, Jr., and R. M. Hamilton, both of Philadelphia, Pa., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,449,821. **Organo-Silicon Compounds.** J. E. Sellers, Scotia, and J. L. Davis, Schenectady, both in N. Y., assignors to General Electric Co., a corporation of N. Y.

2,449,828. **Resinous Material Produced by Heating at Polymerizing Temperatures a Mixture of Polylactic Acids, Fatty Drying Oils, and Oil-Soluble Petropols.** P. D. Watson, Arlington, Va., assignor to the United States of America, as represented by the Secretary of Agriculture.

2,449,876. **Plastic Composition Obtained from a Resinous Reaction Product of Phenol, Aniline and Formaldehyde Reacted with a Vegetable Protein, and Reinforced with a Long Fibered Filler.** F. E. Calvert and P. A. Bury, assignors to Drackett Co., all of Cincinnati, O.

2,449,879. **Synthetic Rubber Reclaimed with an Oil Composed of Solvent Naphtha and an Aromatic Hydrocarbon Oil.** F. W. Corkery, Crafton, assignor to Pennsylvania Industrial Chemical Corp., Clairton, both in Pa.

2,449,928. **Synthetic Rubber Plasticized with a Composition Composed Essentially of an Aromatic Hydrocarbon Oil.** F. W. Corkery, Crafton, assignor to Pennsylvania Industrial Chemical Corp., Clairton, both in Pa.

2,449,929. **Elastomer Plasticizing Composition Composed of Coumarone Resin and an Aromatic Hydrocarbon Oil.** F. W. Corkery, Crafton, Pa., assignor to Pennsylvania Industrial Chemical Corp., Clairton, both in Pa.

2,449,940. **Unsymmetrical Organo-Disiloxanes.** J. F. Hyde, assignor to Corning Glass Works, both of Corning, N. Y.

2,449,949. **Clear, Transparent Hydrogenation Product of a Linear Copolymer of (1) a Mixture of 2-Methyl-1,3-Pentadiene and 4-Methyl-1,3-Pentadiene with (2) a Compound from the Group of Styrene, Alpha-Methyl Styrene, Dichlorostyrene, and 1,3-Butadiene.** R. C. Morris and J. L. Van Winkle, both of Berkeley, assignors to Shell Development Co., San Francisco, both in Calif.

2,449,956. **Dialcyclohexyl Glycols and Derivatives thereof.** E. C. Shokal, Oakland, and R. C. Morris, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,449,959. **Vinylidene Chloride Resin Plasticized with a Di-Ester of Endomethylene Tetro-Hydro Phthalic Acid.** H. P. Staudinger, Ewell, D. Faulkner, Cambridge, and G. T. Wright, Manchester, all in England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

Dominion of Canada

450,690. **Silicon Compound Having the Formula $(Cl_2SiCH_2)_x$ wherein x Is Equal to at Least 3.** W. I. Patnode, Schenectady, N. Y., and R. W. Schiessler, State College, Pa., both in the U.S.A., assignors to Canadian General Electric Co., Ltd., Toronto, Ont.

450,708. **Plastic Polymeric Derivatives of Chloroprene.** L. H. Howland, Cheshire, Conn., U.S.A., assignor to Dominion Rubber Co., Ltd., Montreal, P.Q.

450,719. **Reclaiming Mixed Rubber and Neoprene Compositions with the Aid of an Aliphatic Polyamine.** R. A. Crawford, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,720. **Heat Resistant Rubber Produced by Incorporating an Amino Alcohol and an Organic Compound Having at Least Two Connected Sulfur Atoms.** R. A. Emmett, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,724. **Artificial Aqueous Dispersion of Zinc Oxide Containing Reclaimed Rubber and an Ammonium Soap, and Having a Sufficient Quantity of the Zinc Oxide Reacted with a Water-Soluble Basic Sulfide to Prevent Formation of Such an Amount of Zinc Ammonium Complex as Would Destabilize the Dispersion.** D. E. Fowler, Naugatuck, Conn., assignor to Dispersions Process, Inc., New York, N. Y., both in the U.S.A., assignor to International Latex Processes, Ltd., London, England.

450,753. **Benzene-Sulphonylthioureas.** P. Charpentier, Choisy-le-Roi, Seine, assignor to Societe des Usines Chimiques Rhone Poulenc, Paris, both in France.

450,756. **Polymerization of Cyclopentadiene with Surface Active Clay in a Hydrocarbon Solvent.** F. J. Soday, Swarthmore, assignor to United Gas Improvement Co., Philadelphia, both in Pa., U.S.A.

450,888. **Polymerization of Unsaturated Organic Compounds in the Presence of a Catalyst Including a Water Soluble Heavy Metal Salt Combined with an Aliphatic Keto Substituted Carboxylic Acid.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,889. **Polymerization of Conjugated Butadiene Hydrocarbon in an Aqueous Emulsion in the Presence of a Tetra-Alkyl Thiuram Sulfide in Which the Alkyl Groups Contain a Total of at Least 12 Carbon Atoms.** G. L. Browning, Jr., assignor to Hycar Chemical Co., both of Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,890. **Polymerizing Butadiene in Aqueous Emulsion in a Vessel in Which the Surfaces Contacting the Emulsion during Polymerization Are of an Alloy Containng 80-70% Nickel, 15-20% Chromium, and 5-10% Iron.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,891. **Polymerizing a Butadiene and an Unsaturated Organic Compound in the Presence of an Aliphatic Diazo Compound.** W. L. Semon, Silver Lake, and C. F. Fryling, Akron, both in O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,892-893. **Polymerizing a Conjugated Butadiene in Aqueous Emulsion in the Presence of a Heavy Metal Catalyst Obtained by Combining a Water-Soluble Heavy Metal Salt and a Saturated Aliphatic Carboxylic Acid.** W. D. Stewart, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y., both in the U.S.A.

450,964. **Rubber Hydrochloride Film Plasticized with about 30% of Dimethoxyethyl Phthalate to Increase its Impact Strength.**

H. J. Osterhof, Cuyahoga Falls, and LaV. E. Cheyney, assignors to Wingfoot Corp., both of Akron, both in O., U.S.A.

450,965. **Tetrahydrofurfuryl-Alpha-Chloroacrylate.** J. G. Lichty, Stow, assignor to Wingfoot Corp., Akron, both in O., U.S.A.

450,966. **Composition Including a Monomeric Vinylidene Compound Interpolymerized with a Monomeric Allyl Carballoxyalkyl Carbonate.** C. R. Milone, Cuyahoga Falls, assignor to Wingfoot Corp., Akron, both in O., U.S.A.

450,989. **Sulfonated Hydrogenated Castor Oil.** G. W. Fiero, Buffalo, N. Y., U.S.A.

451,023. **Condensation Product of Ethylene Sulfide and Cyanamide.** L. P. Moore, New York, N. Y., and W. P. Ericks, Stamford, Conn., assignors to American Cyanamid Co., New York, N. Y., both in the U.S.A.

451,028. **Purifying 2-Aminothiazole.** E. Kuh, New Brunswick, and W. B. Neier, North Plainfield, both in N. J., assignors to American Cyanamid Co., New York, N. Y., both in the U.S.A.

451,057. **Production of Vinyl Crotonate by Contacting Acetylene with Crotonic Acid in the Presence of Ethylidene Dicrotonate and at a Temperature not Exceeding 50° C in the Presence of a Mercury Catalyst.** K. H. W. Tuerck, Banstead, Surrey, England, assignor to Distillers Co., Ltd., Edinburgh, Scotland.

451,058. **Acrolein Oxime and Acrylonitrile.** K. H. W. Tuerck, Banstead, Surrey, and H. J. Lichtenstein, London, both in England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

451,059. **Production of Styrene and Its Homologs by Dehydrogenation.** H. M. Stanley, Tadworth, F. E. Salt, Banstead, and T. Weir, Epsom, all in Surrey, England, assignors to Distillers Co., Ltd., Edinburgh, Scotland.

451,079. **In Adhesive Material, a Pressure-Sensitive Adhesive Mass and a Barrier Layer Including Polyisobutylene, a Filler Inert to the Adhesive Mass, and a Non-Oxidizing Resin Compatible with the Polyisobutylene and the Adhesive Mass.** D. J. Buckley, Baton Rouge, La., and R. L. Smith, Otego, N. Y., both in the U.S.A., assignors to Johnson & Johnson, Ltd., Montreal, P.Q.

451,205. **In Electrical Apparatus Including a Casing in Which Electrical Members Are Disposed, Sheet Insulation Applied to the Members and Consisting of a Cellulosic Material Impregnated with Cross-Linked Vinyl Resin Which Will Swell, but not Dissolve in Chlorinated Hydrocarbon Liquids.** T. W. Dakin, Pittsburgh, Pa., U.S.A., assignor to Canadian Westinghouse Co., Ltd., Hamilton, Ont.

451,226. **Butadiene from n-Dichlorbutane.** M. M. Cunradi and H. Krekeler, Ludwigshafen-on-Rhine, and A. Cantzler, Mannheim, assignors to I. G. Farbenindustrie A.G., Frankfort-on-Main, all in Germany, assignor to Jasco Inc., Linden, N. J., U.S.A.

451,257. **Isobutylene from Butane.** K. C. Laughlin, Baton Rouge, La., assignor to Standard Oil Development Co., Linden, N. J., both in the U.S.A.

451,269. **Production of High Molecular Weight Polyene Aldehydes by Subjecting Crotonaldehyde to a Condensation Reaction.** G. W. Seymour and V. S. Salvin, Cumberland, Md., assignors to C. Dreyfus, New York, N. Y., both in the U.S.A.

451,317. **Production of Styrene Compounds by Pyrolysis.** W. A. King, North Haven, Conn., assignor to Allied Chemical & Dye Corp., New York, N. Y., both in the U.S.A.

451,343 **For Coating Paper, a Melt Including Paraffin Wax Carrying a Polymerized Isobutylene and Unmilled Powdered Resinous Reaction Product of Rubber and an Amphoteric Metal Halide Compound.** W. H. Bryce, Memphis, Tenn., assignor to Dixie Wax Paper Co., Dallas, Tex., both in the U.S.A.

451,375. **Stable Aqueous Emulsion of Resinous Material.** H. M. Collins, Stamford, Conn., U.S.A., assignor to Shawinigan Chemicals Ltd., Montreal, P.Q.

451,380. **Cyclohexyl Methyl Carbinol from Butadiene and Methyl Vinyl Ketone.** R. C. Morris, Berkeley, and T. W. Evans, Oakland, assignors to Shell Development Co., San Francisco, all in Calif., U.S.A.

451,381. **Insulating a Conductor by Electrodeposition from a Suspension of Finely Divided Refractory Material and a Finely Divided Elastomer.** P. Robinson, Williamstown, assignor to Sprague Electric Co., North Adams, both in Mass., U.S.A.

United Kingdom

605,859. **Film Forming Compositions.** W. W. Triggs (Stein, Hall & Co., Inc.).

605,863 **Thermoplastic Compositions.** Distillers Co., Ltd., Expanded Rubber Co., Ltd., J. J. P. Staudinger, B. K. Kelly, and A. Cooper.

605,929 **Manufacture of Interpolymers of Styrene with Polyhydric Alcoholic Mixed Esters and Coating Compositions Obtained therewith.** L. Berger & Sons, Ltd., Petrocarbon, Ltd., L. E. Wakeford, D. H. Hewitt, F. Armitage, and H. Steiner.

605,972. **Plastic Material.** L. Finkelstein.

606,050. **Vinyl Copolymers.** Mo Och Domsjo A.B.

606,080. **Unsaturated Polymeric Material.** United States Rubber Co.

606,081. **Softeners for Rubbers.** United States Rubber Co.

606,085. **Trimeric Alpha Methyl Para Methyl Styrene.** Standard Telephones & Cables, Ltd.

MACHINERY

United States

2,448,274. **Apparatus to Form a Plastic Sheet into a Canopy or the Like.** M. P. H. Peterson, assignor to Goodyear Aircraft Corp., both of Akron, O.

2,448,492. **Apparatus to Form by Centrifugal Force Bubbles and Like Articles Made of Thermoplastic Sheet Material.** R. Mayne, assignor to Goodyear Aircraft Corp., both of Akron, O.

2,448,947. **Injection Molding Apparatus.** H. J. Arthur, Chicago, and H. S. McCrory, Berwyn, both in Ill., assignors to Western Electric Co., Inc., New York, N. Y.

2,449,355. **Internal Two-Zone Heat Control for Plastics Extruder.** R. M. Wiley, Midland, and E. V. Dettmer, Bay City, assignors to Dow Chemical Co., Midland, both in Mich.

2,449,512. **Apparatus for Making Hollow Plastic Articles.** C. Scheuer, Forest Hills, N. Y.

2,449,652. **Extruder.** A. L. Heston, assignor to National Rubber Machinery Co., both of Akron, O.

Dominion of Canada

450,645. **Plastics Molding Machine.** E. R. Knowles, Nashua, N. H., U.S.A.

450,668. **Apparatus for Mixing, Rendering Plastic, and Reducing Pulverulent Materials.** C. E. Osborne, Sr., Rahway, assignor to P. O. Abbe, Inc., Little Falls, both in N. J., U.S.A.

450,759. **Device to Foam Liquids.** A. W. Keen, Packanack Lake, N. J., assignor to United States Rubber Co., New York, N. Y., both in the U.S.A.

450,885. **Retread Vulcanizer.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O., U.S.A.

450,898. **Extruder for Rubber or Synthetic Plastic.** F. T. Griffiths, Gravesend, Kent, assignor to W. T. Henley's Telegraph Works Co., Ltd., Dorking, Surrey, both in England.

450,943. **Vulcanizing Kettle Supply System.** E. A. Glynn, assignor to Super Mold Corp. of California, both of Lodi, Calif.

451,157. **Injection Unit for Plastic Molding.** E. R. Knowles, Nashua, N. H., U.S.A.

UNCLASSIFIED

United States

2,448,414. **Apparatus for Lifting and Supporting Rim-Equipped Tires.** C. E. Branick, Fargo, N. D.

2,448,677. **Closure for Inflatable Structures.** G. D. Mallory, assignor to Wingfoot Corp., both of Akron, O.

2,448,730. **Skidless Steel Grip for Auto Tires.** L. Paraskevas, Washington, D. C.

2,448,743. **Cord Processing Apparatus.** R. E. Solliday and H. E. Riggs, assignors to Wingfoot Corp., all of Akron, O.

2,448,909. **Removing Insulation from Metallic Electric Conductors.** Y. Piskac and R. E. Smiley, both of Maple Heights, assignors by mesne assignments, to Jack & Heintz Precision Industries, Inc., Cleveland, both in O.

2,449,033. **Antiskid Tire Clamp.** D. Younglove Ilion, N. Y.

2,449,215. **Cotton Tire Cord.** C. F. Goldthwait and H. O. Smith, New Orleans, La., assignors to the United States of America, as represented by the Secretary of Agriculture.

2,449,235. **Cord Holder.** C. P. Krupp, Barberton, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,449,245. **Air Hose Connection.** J. J. Nelson, assignor of one-half to T. J. Rozar, both of Birmingham, Ala.

2,449,289. **Axially Shifting Hydraulic Rim and Tire Separating Device.** S. H. Garey, Uvalde, Tex.

2,449,387. **Airbag Cleaning and Buffing Machine.** J. E. Johnson, West Hartford, assignor to National Sherardizing & Machine Co., Hartford, both in Conn.

2,449,499. **Device to Demonstrate the Action of the Front Wheels of Automobiles.** S. R. Milburn, Mountain View, N. J., assignor to United States Rubber Co., New York, N. Y.

2,449,544. **Tire Carrier for Trucks.** D. R. Ballard, Madera, Calif.

2,449,659. **Quick Coupling for Hose.** R. C. Lane, San Carlos, Calif.

2,449,660. **Cable Connector.** W. M. Lawhorne, Primos, assignor to Atlantic Refining Co., Philadelphia, both in Pa.

2,449,672. **Sandblast Nozzle Control.** W. A. Rich, Leipsic, O.

2,449,798. **Hose Clamp.** E. L. Weber, Venice, Calif.

2,449,950. **Connector for Belts.** E. Nassimbene, assignor to Gates Rubber Co., both of Denver, Colo.

2,449,960. **Tire Removing Device.** L. A. Toles, Ridgeville Corners, O.

Dominion of Canada

450,643. **Tire Buffing Stand.** P. E. Hawkinson, Minneapolis, Minn., U.S.A.

450,650-652. **Wheel Structure.** G. A. Lyon, Allenhurst, N. J., U.S.A.

450,666. **Stretching and Clamping Tool for Tire Tubes.** R. Vachon, Montreal, P.Q.

450,729. **Tire Carrying Rim.** C. W. Sinclair, assignor to Kelsey-Hayes Wheel Co., both of Detroit, Mich., U.S.A.

450,730. **Tire Carrying Rim.** E. R. Jacobi, assignor to Kelsey-Hayes Wheel Co., both of Detroit, Mich., U.S.A.

450,807. **Brake Drum in a Demountable Wheel.** J. C. Lewis, Detroit, Mich., U.S.A.

450,812-813. **Wheel Structure.** G. A. Lyon, Allenhurst, N. J., U.S.A.

450,859 **Joint for Gas-Filled Cables.** G. B. Shanklin, Schenectady, N. Y., U.S.A., assignor to Canadian General Electric Co., Ltd., Toronto, Ont.

450,863. **Cable Joint.** L. L. Phillips, Pittsfield, Mass., U.S.A., assignor to Canadian General Electric Co., Ltd., Toronto, Ont.

450,906. **Joint for Coaxial Conductor Electric Cables.** H. Birkby, London, England, assignor to International Standard Electric Corp., New York, N. Y., U.S.A.

451,129. **Joint.** C. K. Stillwagon, assignor to Well Equipment Mfg. Corp., both of Houston, Tex., U.S.A.

451,293. **Wire Stripper.** R. Gordon, Milwaukee, Wis., U.S.A.

451,336-337. **Antiskid Device.** J. J. Cook, assignor to John J. Cook Mfg. Co., both of Detroit, Mich., U.S.A.

451,392. **Removal of Metal Wire from Vulcanized Rubber, as Rims of Tire Covers.** F. H. Cotton, East Barnet, and P. A. Gibbons, London, both in England, assignors to said F. H. Cotton.

TRADE MARKS

United States

440,379. Representation of a boy wearing a Scotch cap and the words: **"Scotch Boy."** Adhesive tape. Minnesota Mining & Mfg. Co., St. Paul, Minn.

440,379. **Melastic.** Rubber cements. L. E. Warford, doing business as Melflex Products Co., assignor to Melflex Products Co., all of Akron, O.

440,412. Representation of a triangle between four lines and containing four stars and the letters: **"WSC."** Liquid cement. Windsor Lloyd Products, Inc., Philadelphia, Pa.

440,445. Representation of the letter: **"R"** on the sides of which are designs on which is superimposed the word **"Reeco."** Tennis balls. M. B. Ross, doing business as Ross Engineering & Equipment Co., Wichita, Kan.

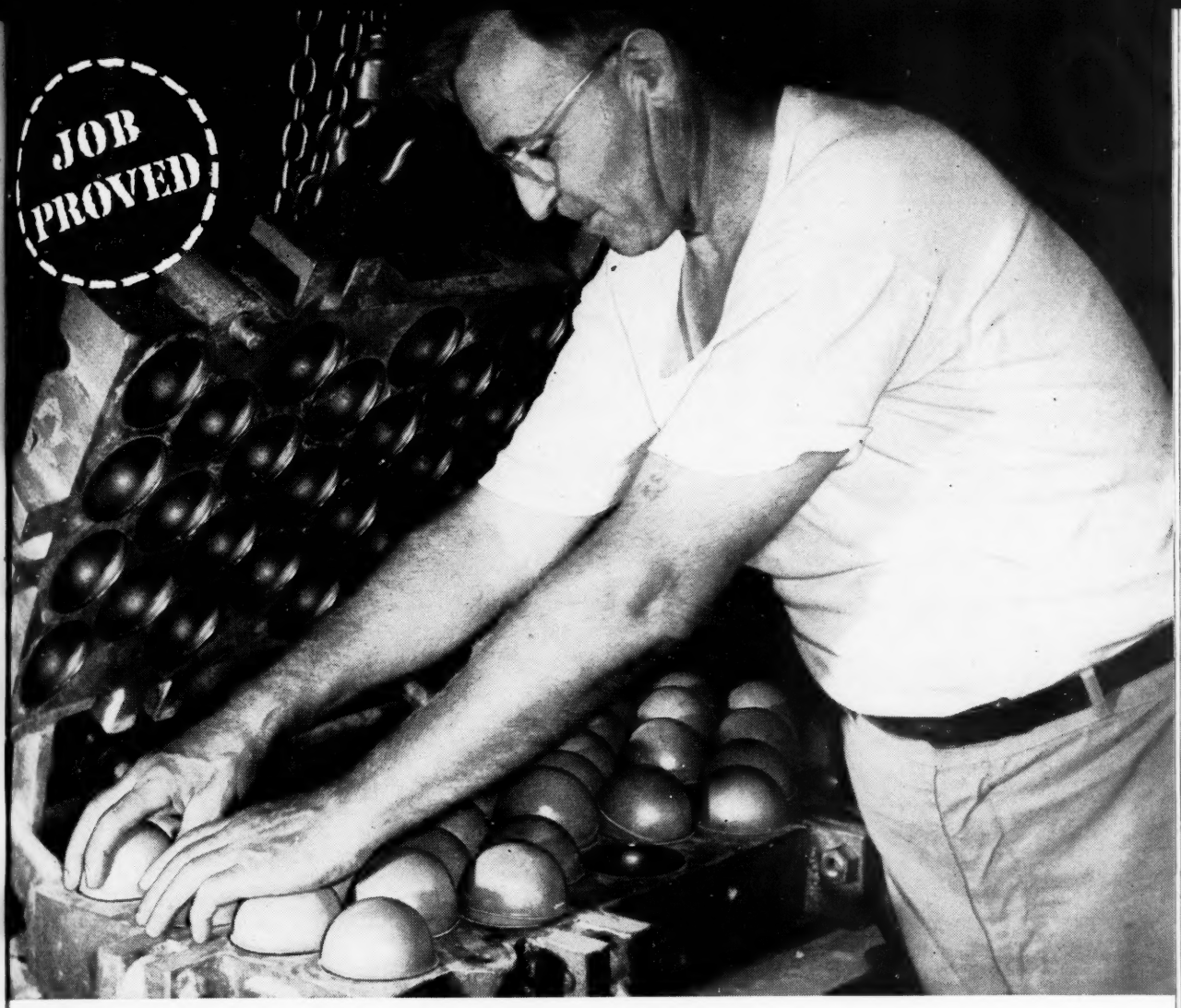
440,451. **Top-Flex.** Rubbers. Transcontinental Rubber Corp., New York, assignor to Transcontinental Shoe Corp., Brooklyn, both in N. Y.

440,484. **Hoco.** Plumbers' rubber supplies. H. O. Canfield Co., Bridgeport, Conn.

440,498. **Honeyfoam.** Toys. Ideal Novelty & Toy Co., Hollis, N. Y.

440,500. Representation of an oblong containing the words: **"Pro-Line."** Plumbers'

(*Continued on page 272*)



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Sun Rubber-Processing Aid Improves Appearance of Rubber Toys, Cuts Manufacturing Costs

A manufacturer of rubber balls, miniature trucks, and other rubber toys was losing money because processing oils were bleeding out of the finished toys and spoiling the paint coating.

Switching to one of Sun's "Job Proved" Rubber-Processing Aids, he was able to stop all bleeding and at the same time make his lacquer finishes brighter and more enduring. Production men figured that costs were reduced by $1,500 a month.

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Sun offers five "Job Proved" rubber-processing aids

1. **Circo Light Process Aid,** a general-purpose softener for neoprene and natural rubber.
2. **Circosol-2XH,** an elasticator for GR-S, a plasticizer for natural rubber.
3. **Circomar-5AA,** a free-flowing softener of the asphalt-flux type that is easy to handle at room temperature. Widely used for natural rubber and GR-S.
4. **Sunaptic Acid-130,** a mixture of high molecular weight naphthenic acids and hydrocarbon oil. It functions in the same manner as stearic acid in the activation of curing agents for rubber. It is "non-blooming."
5. **Sundex-53,** a low-cost processing aid, highly compatible with natural and GR-S.

SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

SUNOCO

OTS Bibliography: Reports on Rubber Products—XIV

These reports and abstracts thereof given below are taken from the Department of Commerce's monthly publication, "Bibliography of Scientific and Industrial Reports." Reports available in microfilm, enlargement print, or photostatic form may be obtained from the Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D. C., with accompanying check or money order payable to the Librarian of Congress. Reports available in printed or mimeographed form may be obtained from the Office of Technical Services, United States Department of Commerce, Washington 25, D. C., with accompanying check or money order payable to the Treasurer of the United States.

Ethylbenzene Production. I. G. Farbenindustrie A. G. PB-L-35240. (Part of PB-13322). April, 1945. 7 frames. Microfilm $1; enlargement print $1.50. This is a detailed description of equipment for the production of ethylbenzene from benzene and ethylene with aluminum chloride as catalyst, and for its subsequent distillation. Three flow sheets are attached. (In German.)

Styrene. I. G. Farbenindustrie A. G. PB-L-35243. (Part of PB-13322.) July, 1945. 2 frames. Microfilm $1; enlargement print $1.50. This brief note describes two analytical methods for styrene: (1) determination of the latent period of polymerization, and (2) determination of the divinylbenzene content. (In German.)

The Development of the New Styrene Catalysts. Ohlinger. PB-L-35254. (Part of PB-13322.) July, 1944. 13 frames. Microfilm $1; enlargement print $1.50. The development of the two catalysts Lu-82 and Lu-144-G and styrene yields obtained by their use are described in this report. Both consist of zinc oxide, 82-85%, aluminum oxide, 3-6%, calcium oxide, 5%, potassium chromate, 2%, and potassium sulfate, 2-3%. Potassium hydroxide, 2%, is used in Lu-82, and is replaced by magnesium oxide, 5%, in Lu-144-G. One flow sheet is attached which deals with utilization of the dehydrogenation gas. (In German.)

General Summary of Production and Use of Reclaimed Rubber in Germany. U. S. Rubber Bureau. PB-L-86006. August, 1945. 14 pages. Microfilm $1.25; photostat $2. These data were compiled by the United States members of the mission which investigated German plants immediately after the fall of Germany.

Various Polymerization Experiments. Blomer. PB-L-35329. August 1943. 2 frames. Microfilm $1; enlargement print $1.50. The report deals with alkylene oxides as regulators, the relation between the grade of the polymer and the yield, and the substitution of sodium hydroxide in Nekal mixtures by organic bases. (In German.)

Directions for the Processing of Buna N. PB-L-35330. 4 frames. Microfilm $1; enlargement print $1.50. Directions are given for the production of the Buna N processing mixture and for blends of Buna N with natural rubber, reclaimed rubber, and factices. General properties of Buna N are included. (In German.)

Polymerization of Buna S by Means of Chloramide. Rohm. PB-L-35340. January, 1944. 5 frames. Microfilm $1; enlargement print $1.50. Under certain conditions higher polymerization speeds may be attained with hypochlorites and chloramides than with persulfate. Stabilizers such as dodecylphenol and isobutylnaphthol may be added to obtain especially soft products. At higher polymerization temperatures and by the addition of certain sulfur-free regulators, one may attain higher polymerization speeds than are obtained with Diproxid. (In German.)

Preparation of Buna 32 Types by Emulsion Polymerization. Wolz. PB-L-35341. May, 1944. 5 frames. Microfilm $1; enlargement print $1.50. Buna 32-E (100% butadiene) was compared with Buna 32-S (75% butadiene, 25% styrene) and Buna 32-SS (55% butadiene, 45% styrene). All three products have K-values of 28-32. The two emulsion polymerization products were no better qualitatively than Buna 32-E and, in addition, were more expensive to produce. (In German.)

German General Rubber Goods Industry. Part III. Factory Lay-Out and Plant. W. H. Reece and others. PB-L-87908. October-December, 1946. 422 pages. Photostat $43; microfilm $7. A total of 33 targets was inspected in the British and the American zones. Technical information concerning factory lay-out and plant is given, and 184 drawings and photographs are appended. For Part I of this report see PB-L-23858; Part II, PB-L-63603.

Buna SR. Stocklin. PB-L-35322. March, 1942. 24 frames. Microfilm $1; enlargement print, $2.50. Buna SR was compared with Buna R, Buna SS, and several samples of Buna S. Buna SR was considered to be as useful as Buna SS for certain rubber goods. Buna SR, however, exhibited insufficient elasticity and cold resistance and was found unsuitable for tires and inner tubes. (In German.)

Composition and Properties of the Various Types of Buna Commercially Available. PB-L-35323. 12 frames. Microfilm $1; enlargement print, $1.50. This report briefly lists the composition, properties, manner of production, and % yield of the Buna brands (including Perbunan and Perbunan Extra). (In German with an English translation.)

Testing of New Products in Polymerization. Graulich. PB-L-35326. September, 1942. 3 frames. Microfilm $1; enlargement print $1.50. Reports cover tests with dihydronaphthalene, substituted chloroprene, and diazotized substituted aniline derivatives of butadiene as copolymers for butadiene. (In German.)

Buna SW. PB-L-35328. February, 1943. 4 frames. Microfilm $1; enlargement print $1.50. A brief discussion appears on the properties of Buna SW. The product is compared with Buna containing a higher content of styrene. (In German.)

Buna S Containing No Linoleic Acid. Wollthan. PB-L-35367. March, 1943. 3 frames. Microfilm $1; enlargement print $1.50. The report discusses difficulties encountered in production of linoleic acid-free Buna S. The samples of Buna S were prepared in both enameled and lead-lined kettles. The use of Diproxid in polymerization is also considered. (In German.)

Buna S Containing No Linoleic Acid. Oettner. PB-L-35368. December, 1942. 8 frames. Microfilm $1; enlargement print $1.50. Several samples of linoleic acid-free Buna S from Leverkusen, Ludwigshafen, and Schkopau were tested in the tire division of Leverkusen. All samples had Defo values of 2,800-3,600. The linoleic acid-free Buna S in general was as good as normal Buna S and exhibited better welding properties. The effect of linoleic acid upon weldability is demonstrated. (In German.)

The Continuous Polymerization of Buna S Containing No Linoleic Acid. Holzrichter and Falk. PB-L-35373. August, 1942. 8 frames. Microfilm $1; enlargement print $1.50. An investigation was made of the following: polymerization with Nekal BX dry and Nekal BGX; production of polymers having different yields; effect of regulators; working up latices; and breakdown behavior. (In German.)

The Acid Polymerization of Buna N. Graulich. PB-L-35376. October, 1942. 4 frames. Microfilm $1; enlargement print $1.50. Comparison of acid and alkaline polymerization of Buna N. An equivalent product can be produced on plant scale by acid polymerization. The speed of polymerization of acid Buna N mixtures is higher than with alkaline mixtures. (In German.)

High-Pressure Polymerization. Becker. PB-L-35402. January, 1942. 2 frames Microfilm $1; enlargement print $1.50. The report discusses the yield and reaction rate. Copolymerization of butadiene with styrene in a high-pressure autoclave was quite similar to that obtained in a normal polymerization tube with regard to speed and quality. Average and optimum values for both polymerizations are given. (In German.)

Polymerization with Addition of Radical-Forming Substances. Blomer. PB-L-35363. August, 1943. 4 frames. Microfilm $1; enlargement print $1.50. Experiments deal with the regulator effects produced by addition of "diazoessig ester," phenylazotriphenylmethane, and tetraphenylsuccinonitrile in acid polymerization of Buna S. Other experiments deal with the effects produced by radicals such as triphenylmethyl, diphenyl-mono-biphenylmethyl, and alpha-naphthyldibiphenylmethyl in the polymerization of dimethylbutadiene. (In German.)

Masticating Agents for Buna S and Perbunan. Schwerdtel. PB-L-35428. February, 1943. 1 frame. Microfilm $1; enlargement print $1.50. Nine phenylhydrazine derivatives such as benzaldehyde-phenylhydrazone and n-formylphenylhydrazine in 2% and 5% quantities were compared with Renacit II as masticating agents for Buna S. The same substances in 3% quantities were compared with 6% Renacit III as agents for the breakdown of Perbunan. (In German.)

Research on Mastication. Ecker. PB-L-35429. April, 1940. 4 frames. Microfilm $1; enlargement print $1.50. Buna S, Buna SS, and Perbunan were masticated at rolling temperatures of 25, 50, 75, 100, and 125° C. with and without the addition of beta-thionaphthol (Renacit II). It was demonstrated that the desired Defo values could be obtained with proper choice of rolling temperature. (In German.)

Development of a Highly Cold Resistant Buna. Ecker. PB-L-35433. October, 1942. 20 frames. Microfilm $1; enlargement print $2. Tests of a butadiene-styrene mixture (90:10). Tests deal with plasticity, adhesiveness, vulcanization, mechanical testing, and cold resistance. Tables and graphs are included. (In German.)

Preparation of Solid Tires with Desmodur R. PB-L-35442. 7 frames. Microfilm $1; enlargement print $1.50. This report describes the coating of steel tires with Desmodur R and then covering with the face stock. Buna S-3 is preferred to Buna S-1 for the face stock because the former develops a higher resistance to crushing and exhibits lower heat build-up. (In German with English translation.)

Plasticizer 32K. Schmidt. PB-L-35501. July, 1943. 8 frames. Microfilm $1; enlargement print $1.50. Plasticizer 32K (polymerized with potassium), a product of Schkopa, was compared with Plasticizer 32E (emulsion polymerized) and with Plasticizer 32 (normal product) for plasticizing and spraying properties in Buna S and Perbunan. Comparison tests of the increase in cold resistance in the three types were also carried out. (In German.)

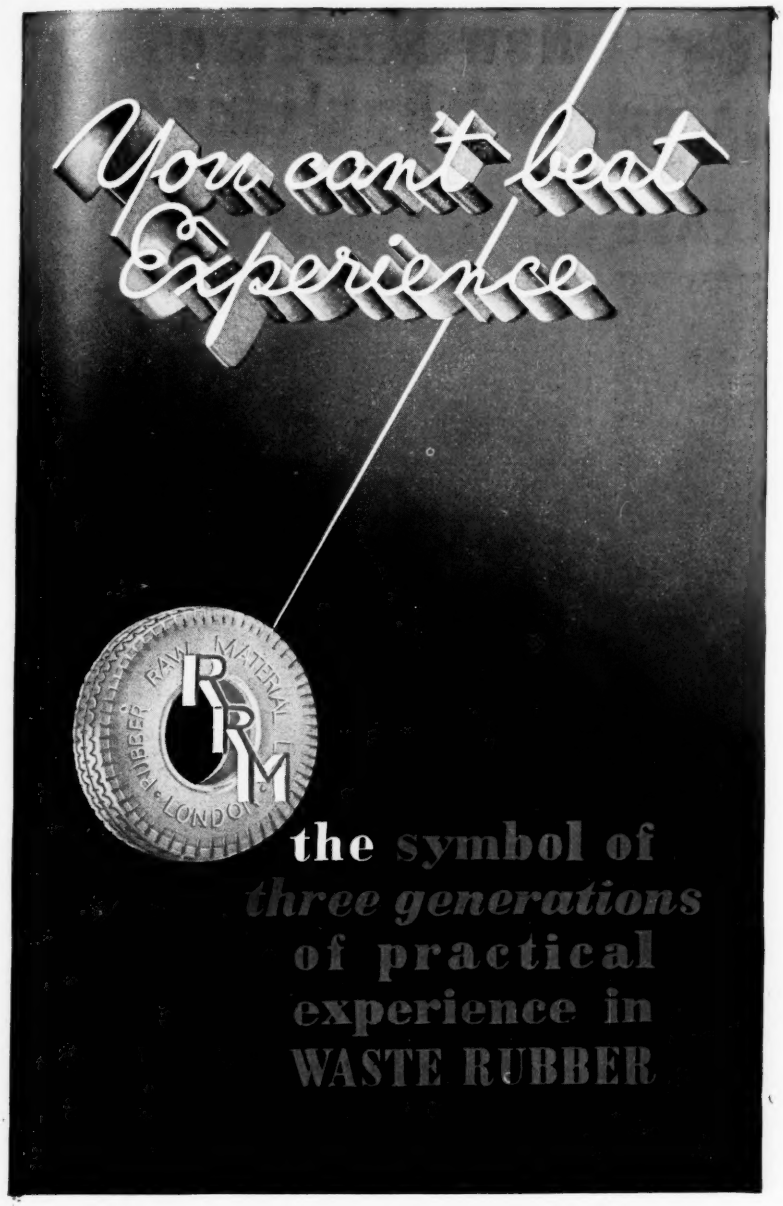
Laboratory Testing of Koresin Made from Butylphenol by Means of Vinylation without Pressure. Schmidt. PB-L-35503. March, 1944. 8 frames. Microfilm $1; enlargement print $1.50. Owing to the lack of pressure equipment to meet the increased demand for Koresin, the pressureless procedure was undertaken. The Koresin produced by the pressureless vinylation showed only slight differences as compared with that produced by the old method; these differences were within the limits of error of the test method. (In German with English translation.)

Hardening of Reclaimed Buna S in Storage. Schmidt. PB-L-35521. February, 1943. 13 frames. Microfilm $1; enlargement print $1.50. The report gives the results of a one-year test of the hardening of Buna S tread reclaims. The reclaims had been treated with 1%, 2%, and 3% Renacit II and thioanthracene, and 5% and 15% plasticizing mixture. This mixture consisted of equal parts of mineral oil, Naftolen ZD, and Teerfettol ESS. (In German.)

Properties of Reclaimed Buna S Treads Produced in Various Ways. PB-L-35525. 2 frames. Microfilm $1; enlargement print $1.50. Seven reclaims consisting of Buna S (from tires) and mixtures of Teerfettol ESS, Naftolen ZD, Renacit II, and Kautschol were processed. All test mixtures contained 100 parts reclaim, 1.5 parts sulfur, and 1.0 parts Vulkacit AZ. (In German.)

List of Substances Studied for Their Reclaiming or Degradation Effects. June, 1940. 4 frames. Microfilm $1; enlargement print $1.50. The list includes the Renacits and similar compounds, various other thio- and mercapto- compounds, and many other benzene and naphthalene derivatives. The effects produced are noted briefly. (In German.)

(To be continued)



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DC Mold Release Emulsion No. 35 helps to reduce the cost of producing heavy service as well as passenger tires.

By clean release we mean that tires with a high surface finish and sharp tread blocks are easily removed from molds that stay clean. And that means lower costs and higher quality in an increasingly competitive market. Like most of the leading rubber companies in all parts of the world, the Waco Division of The General Tire and Rubber Company uses DC Mold Release Emulsion No. 35 to assure easy release and good surface appearance in molding Farm Service Tires.

Molds stay clean 5 to 20 times as long because this silicone release agent does not decompose at molding temperatures to form a carbonaceous deposit on the mold. Mold maintenance is, therefore, reduced to a minimum. Scrap cost is lower because surface blemishes, non-knits, and fold-overs are virtually eliminated.

Tire manufacturers also save time and labor by using DC Mold Release Emulsion No. 35 to simplify the bagging and debagging operation. A dilute solution of Emulsion No. 35 is applied to butyl curing bags either by dipping or spraying. The curing bag is prelubricated and slips into the carcass more easily. Inside blemishes such as separated cords and loose tuck-unders are greatly reduced. Service life of bags is increased because they do not stick to the carcass removed after molding.

DC Mold Release Emulsion No. 35 is easy to use either as a mold or curing bag lubricant. Molds may be sprayed, brushed or wiped with a dilute solution containing about 50 to 150 parts of water to 1 part of Emulsion. Bags are lubricated with 1 part Emulsion in about 35 parts of water with additional slip agents included in some applications.

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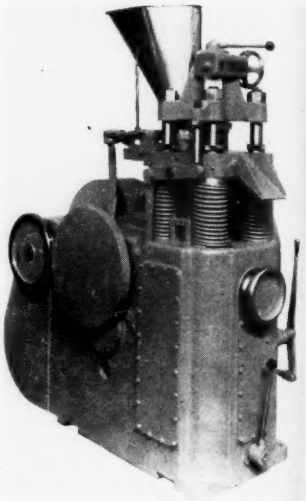
New Machines and Appliances

New Preformer

THE new Model 294 dual-pressure preformer for plastics molding has been announced by F. J. Stokes Machine Co., Philadelphia, Pa. By means of a floating die table, pressure is applied from both top and bottom at the same time to produce preforms of uniform density throughout, thus giving fewer rejects and lower preheating costs. Because of this unique design, less power is required to apply high pressures, and punch and die wear is reduced. Power application is so arranged that the press cannot jam or rest on dead center.



Stokes' Model 294 Dual-Pressure Preformer

The machine will produce preforms up to four inches in diameter with a die fill of 2⅝ inches. The large die area permits the production of irregular and rectangular pieces up to six inches in length and four inches in width. Other features of the preformer include rugged construction, convenient handwheel adjustment while operating, self-lubrication, and dust seals on plunger and tie rods. Auxiliary equipment can be provided for special requirements, including start-stop controls, production counters, and exact pressure controls.

Cutter for Foam Rubber

A NEW machine has been developed to improve and speed up the process of cutting and slicing foam rubber stock. Designed especially for users of foam rubber for cushions and seats, armrests, vibration mounts, surgical appliances, toilet articles, and household novelties, the machine was designed by Campbell Machinery Development Co. and is being manufactured and marketed by Falls Engineering & Machine Co., both of Cuyahoga Falls, O.

This cutter can slice sheets of rubber up to 42 inches square in

FOR FURTHER DETAILS, SEE AD ON PAGE 154

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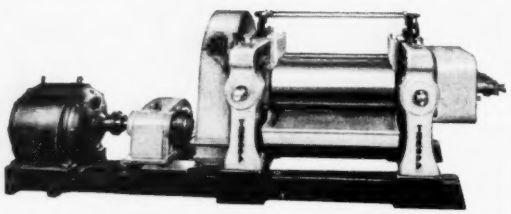

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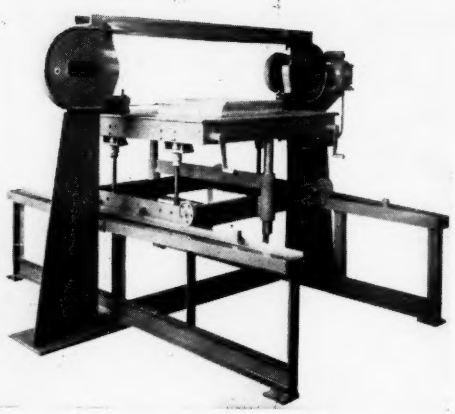
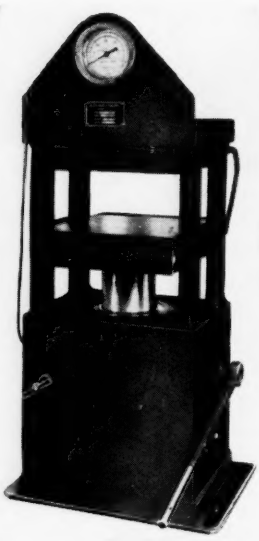


Campbell Cutting Machine

size into quarter-inch thicknesses. Concave and convex cuts on the full width of the stock are made by adjusting the table top of the machine which will tilt 15 degrees horizontally and move eight inches vertically. The table top moves on a roller carriage under a saw blade. One hand-wheel adjusts the table for vertical movement, and two hand-wheels regulate the degree of tilt.

The two 14-inch band saw wheels are mounted on a structural steel frame with the saw operating horizontally. One wheel is driven by a ¾-horsepower motor; while the other is not powered and is adjustable for tensioning the saw blade. The blade is fully guarded except at the cutting edge.



M & N 30-Ton Hot Plate Hydraulic Press

Hot Plate Press

A NEW 30-ton Hot Plate hydraulic press, designed for such applications as plastics laminating, rubber and plastics molding, and for accuracy, speed, and ease of operation in powder metallurgy, forming, drawing, embossing, and hobbing, is being marketed by M & N Machine Tool Works, Inc., Clifton, N. J. This new press is especially suitable for use in the rubber industry where an occasional molding press is desired for short run jobs, sample molds, and experimental work.

Outstanding features of the press include electrically heated, thermostatically controlled platens, a totally enclosed hydraulic system, dual-pressure pump, compactness and convenience for bench use, large platen area, and all-steel construction. Dimensions and specifications are as follows: base, 16 by 12 inches; overall height, 42 inches; platen size, 12 by 12 inches; total pressure on platens, 30 tons; daylight opening, 10 inches length of stroke, six inches maximum; ram diameter, five inches; and approximate total weight, 400 pounds.

Foresee Reduced Swedish Business Activity

Sharp curtailment of production in different industries is foreseen as a result of the drastic restrictions on dollar imports of essential industrial commodities provided for in Sweden's new import plan. With regard to the rubber industry, heavy cuts in supplies of cord fabric and chemicals are expected to lead a reduction of about 50% of the domestic output of automobile tires.

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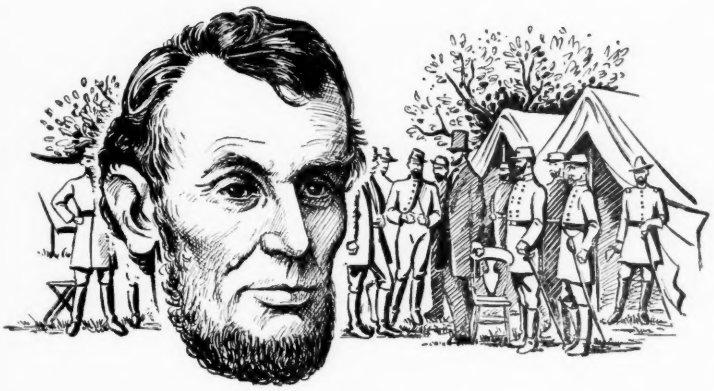
(No. 10 of a series)



AT ONE TIME during the American Civil War, Abraham Lincoln was greatly hampered by a lack of leadership in the Army. General George B. McClellan, then in command of the Union Forces, was conducting an exasperating waiting campaign. He was so careful to avoid mistakes that for a long period of time no headway was evident. President Lincoln thereupon wrote him a letter:

"My dear McClellan: If you don't want to use the Army, I should like to borrow it for a while. Yours respectfully,

A. Lincoln."

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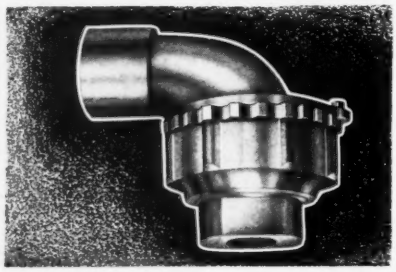

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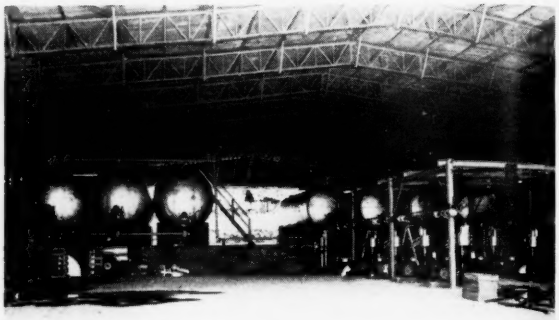
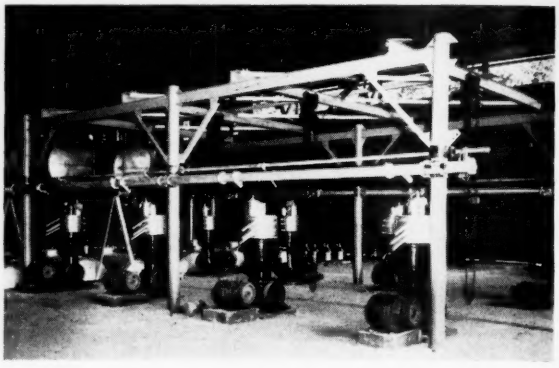


General View of the Petaling Factory Showing Centrifuges and Latex Reception Tanks on the Right, Bulk Storage Tanks on the Left



Centrifuging Machines in the Bulking Plant, Petaling Factory of Harrisons & Crossfield

Names Exclusive U. S. Distributer

Harrisons & Crosfield, Ltd., 1-4 Great Tower St., London, England, recently appointed General Latex & Chemical Corp., 666 Main St., Cambridge 39, Mass., U.S.A., exclusive agent for the sale of Harrisons & Crosfield latex in the United States.

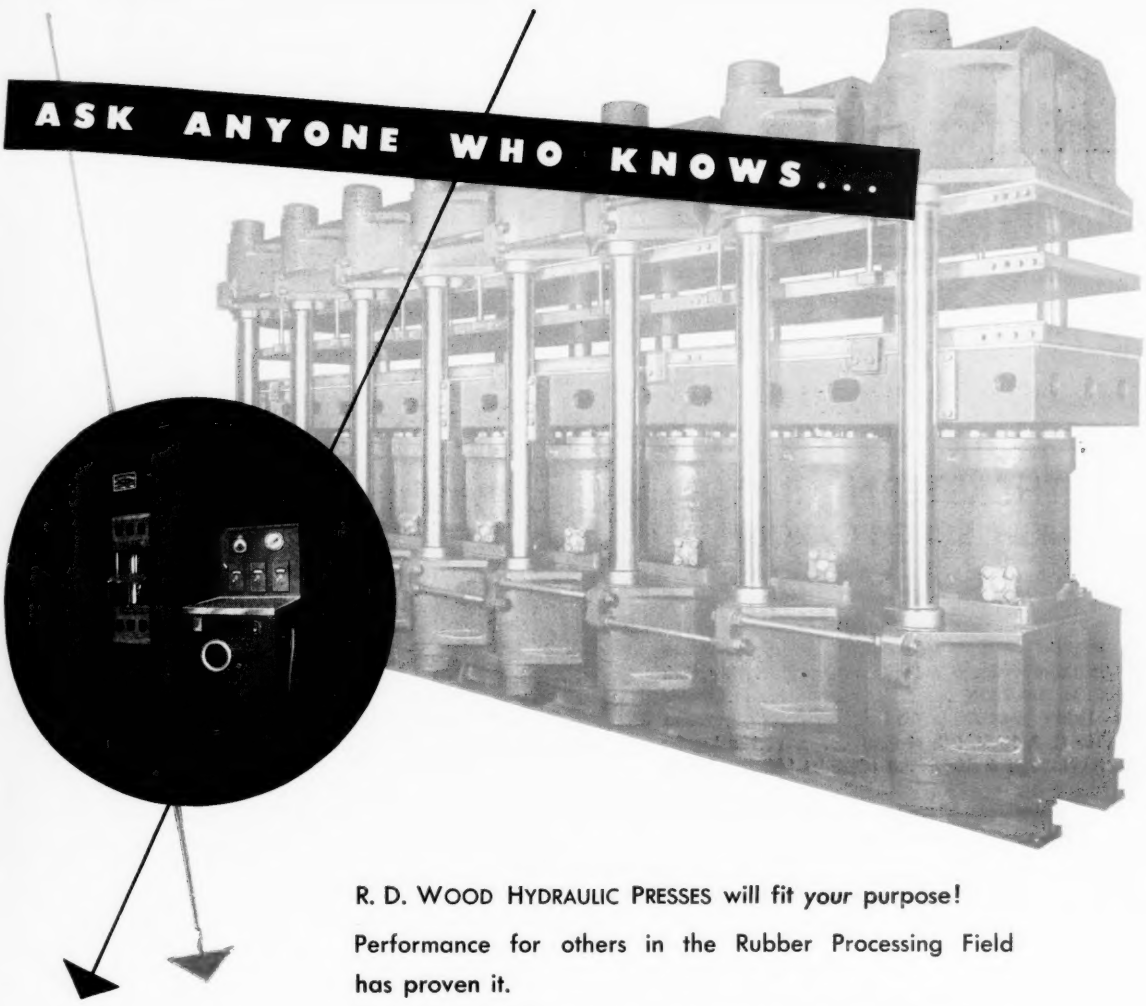
Harrisons & Crosfield, with 46 offices in 12 countries, is one of the largest and most diversified of the latter-day merchant adventurers. The firm was among the pioneers to establish the *Hevea brasiliensis* tree as the basis of the Malayan rubber industry. Today Harrisons & Crosfield controls 10% of Malaya's rubber industry, acting as management agent for 120,000 acres and selling directly from its own holdings. This century-old British house is among the leaders of quality rubber and rubber latex and is a producer of extremely high-grade sole crepe.

Harrisons & Crosfield (Malaya), Ltd., recently completed the construction in Malaya of a large bulking plant and special docking facilities to facilitate the tanker shipments of latex to America and Europe. This bulking plant will provide facilities for the centrifuging, chemical control, and grading of latex.

Cabot to Build Carbon Black Plant

Godfrey L. Cabot, Inc., 77 Franklin St., Boston 10, Mass., U.S.A., has announced plans for the formation of Cabot Carbon, Ltd., which will shortly begin construction of a new 20,000,000-pound annual capacity carbon black plant near Liverpool, England. Cabot will supply approximately one-half the capital required for the new company, and the balance will come from British investors. Louis W. Cabot, grandson of the company's founder, has been appointed resident manager of the new company. Formerly connected with the company's operations in

ASK ANYONE WHO KNOWS...



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the Southwest United States, Mr. Cabot and a staff of engineers arrives in England this month.

Recent action by the Economic Cooperation Administration approved the Cabot plans as the first ECA guaranteed American investment under ERP. Up to $850,000, the amount of the ECA guarantee, will be insured for conversion from sterling to dollars and will be utilized for the return of income to American investors. The Cabot Carbon, Ltd., project was made possible by recent developments permitting the production of carbon black from liquid hydrocarbons. Several sites for the new plant are under consideration on the River Mersey, near Liverpool. The raw material, initially a petroleum derivative, will be supplied by tanker, and from 40 to 60 persons will be employed in operation. Engineering and construction of the plant will be by British concerns under the direction and advice of technicians from the American company. Every effort will be made to place the plant in production before the end of 1950, although the construction time-table will depend on steel availability.

British Trade Notes

E. & M. W. (Latex) Ltd., was recently formed with a capital of £60,000 to carry on the business of wharfingers, warehousemen, and dealers in india rubber, gutta percha, latex, balata, and gums of all kinds, etc.

In September, 1949, is to be opened the biggest trade exhibition ever held in Scotland. Planned along the lines of the British Industries Fair, it will be called the Scottish Industries Fair and is to be run by the Scottish Council (Development Industry) in the Kelvin Hall, Glasgow.

A technical committee to advise on standards for retreading has been set up by the permanent Conference of the Retread Manufacturers' Association under the chairmanship of R. H. Pike, of Pike Tire & Rubber Co., Ltd., Brixton. At the inaugural meeting the chairman indicated that the creation of agreed standards for retreading would be complementary to the recent undertaking of all members to identify their products by adequate brand marks. He added that the committee would also advise on any technical matters referred to it by the conference.

The laminated plastic sheet material known as Formica is now being produced by the De La Rue factory at West Chirton.

The Greengate & Irwell Rubber Co., Ltd., has been carrying on the manufacture of rubber footwear at its factory at Greengate, Salford, despite extensive war damage suffered in December, 1940. Now it has opened a new rubber footwear factory at Black Lane Works, Radcliffe, Lancashire. It is understood that 30 acres of land near the present site have been purchased for future extensions. The company has factories not only in the Manchester district, but also in Glasgow and London and manufactures most types of rubber goods, giving employment to more than 4,000 workers.

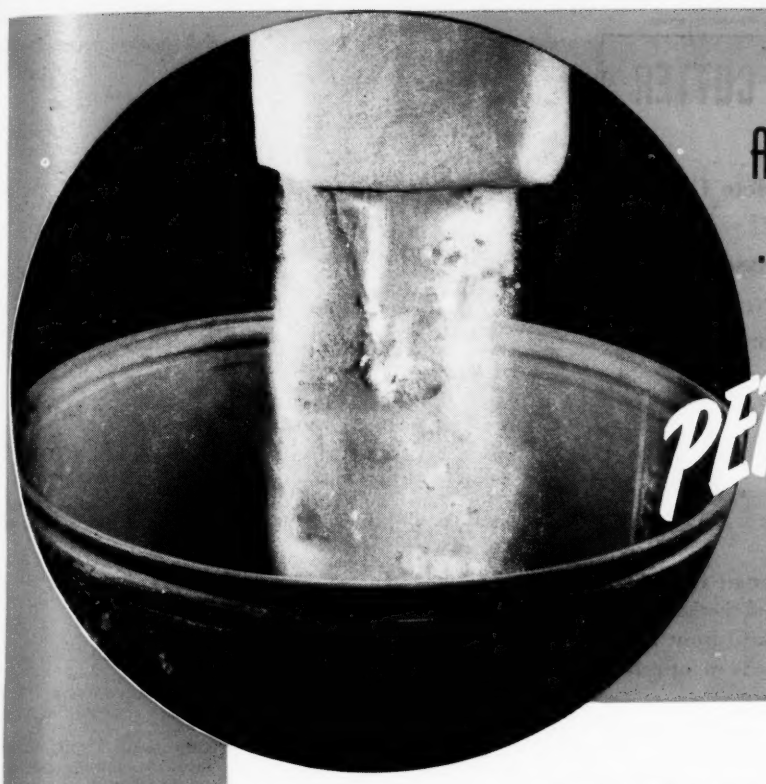
In the House of Commons recently John Strachey, Minister of Food, was asked what steps his department was taking to utilize the large crops of rubber seed that hitherto have annually been allowed to go to waste despite heir high content of edible oil. Mr. Strachey replied that an attempt is to be made this year (presumably with the aid of the Rubber Growers' Association) to collect rubber seeds in Malaya on a large scale with a view to future commercial use. He added that research had so far indicated that rubber seed oil might be more useful for technical than for edible purposes.

It was announced that the series of motor-industry exhibitions organized in London by the Society of Motor Manufacturers & Traders would be resumed this year when the first postwar International Commercial Motor Transport Exhibition was held at Earls Court Exhibition from October 1 to 9. The last previous exhibition took place in 1938. Advance notices indicated that the products of 420 manufacturers would be displayed, with more than 200 showing accessories and components, apparently not including 14 tire manufacturers.

Scottish Plastics Industry

The Scottish Council (Development and Industry) recently issued a report of a committee formed to investigate the development of the plastics industry in Scotland with special reference to the ability of the industry to meet its requirements from raw materials available in Scotland. The committee found side by side with an increase in the number of firms manufacturing finished products from powders obtained elsewhere a static condition insofar as progress in the manufacture of ingredients for forming the molding powders was concerned.

The committee further found that supplies of coal-tar phenol



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3. Produce softer Natural rubber or GR-S in a given milling time.
4. Produce soft GR-S with plasticities which show no appreciable change on standing.
5. Control GR-S gel build-up in hot processing.
6. Plasticize reclaimed rubber, mixtures of reclaimed rubber and Natural rubber or GR-S, and also mixtures of Natural rubber and GR-S.
7. Produce softer or more plastic Natural rubber or GR-S mixed stocks in direct mixing.
8. Reduce heat developed in processing and thereby lower the processing temperatures.
9. Improve processing qualities and reduce rejects.
10. Give good physical properties.

Excellent for Sponge Rubber

WHAT IT WILL NOT DO

1. It will not produce dermatitis or toxic effects.
2. It will not discolor white or light-colored stocks.
3. It will not bloom.
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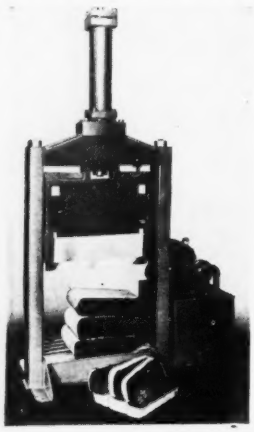

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and cresols for phenol-formaldehyde-type plastics were wholly inadequate so that synthetics would have to be resorted to. For this action, it stated, Scotland has an adequate supply of benzene and toluene and suggested that the large explosives factories erected in Scotland during the war could without much difficulty be converted to the manufacture of synthetic phenols by the sulfonation process.

Then the report pointed to the need of methods for efficient recovery from coal tar of products such as orthoxylene and naphthalene for the manufacture of phthalic anhydride. Turning to polyvinyl chloride-type plastics, methacrylates, and the like in which there is such marked interest everywhere, the committee indicated that the oil refinery and shale oil production industries could produce large volumes of ethylene and propylene in plants now available in Scotland with which to meet the needs of a large plastics industry as well as to provide raw materials for the antiseptic, insecticide, detergent, and synthetic rubber industries. The recovery of ethylene from coke oven gas was also suggested, and it was added that 5% of the estimated power of the hydro-electric schemes set apart for calcium carbide manufacture would make a substantial contribution to the acetylene needs of the plastics industry in Scotland. Finally is was noted that no suitable plasticizers for the manufacture of flexible plastics are at present being made in Scotland.

The committee completed its report with a number of recommendations to meet the situation disclosed by its survey and to give effect to its conclusions.

FRANCE

Monet Plan Discussed by Jacqueau

"Modernization or Regression" was the title of a talk on the Monet Plan recently given by Henri Jacqueau, president of the Technical Committee of the Syndicat du Caoutchouc as well as of the Sub-Committee for Modernization of the Rubber Industry, at the invitation of L. Nico of the Societe Auto-Cable, before a group of rubber men. It was a decree of January 3, 1946, M. Jacqueau recalled, that gave birth to the comprehensive plan for the modernization and economic reequipment of France and her overseas territories, known as the Monet Plan. This plan, he explained, had for its objects increasing production in the motherland and colonies, raising the output of labor to the level of those countries where it was highest, and improving general living conditions. France had for some time been falling behind other countries in efficient productivity, in enterprise, in living standards. Two wars separated by a prolonged economic crisis had served to dissipate the accumulated reserves of the nation which had hitherto permitted a standard of living which, modest though it was, could not have been maintained by the country's activity and the output of labor alone. Now the stage had been reached where work was France's last recourse; it was essential to modernize and reequip industry and agriculture, to push scientific research and improve methods. Increasing the output should be a matter of concern everywhere, M. Jacqueau stressed, for, as he put it, modernization is not a state of things, but a state of mind.

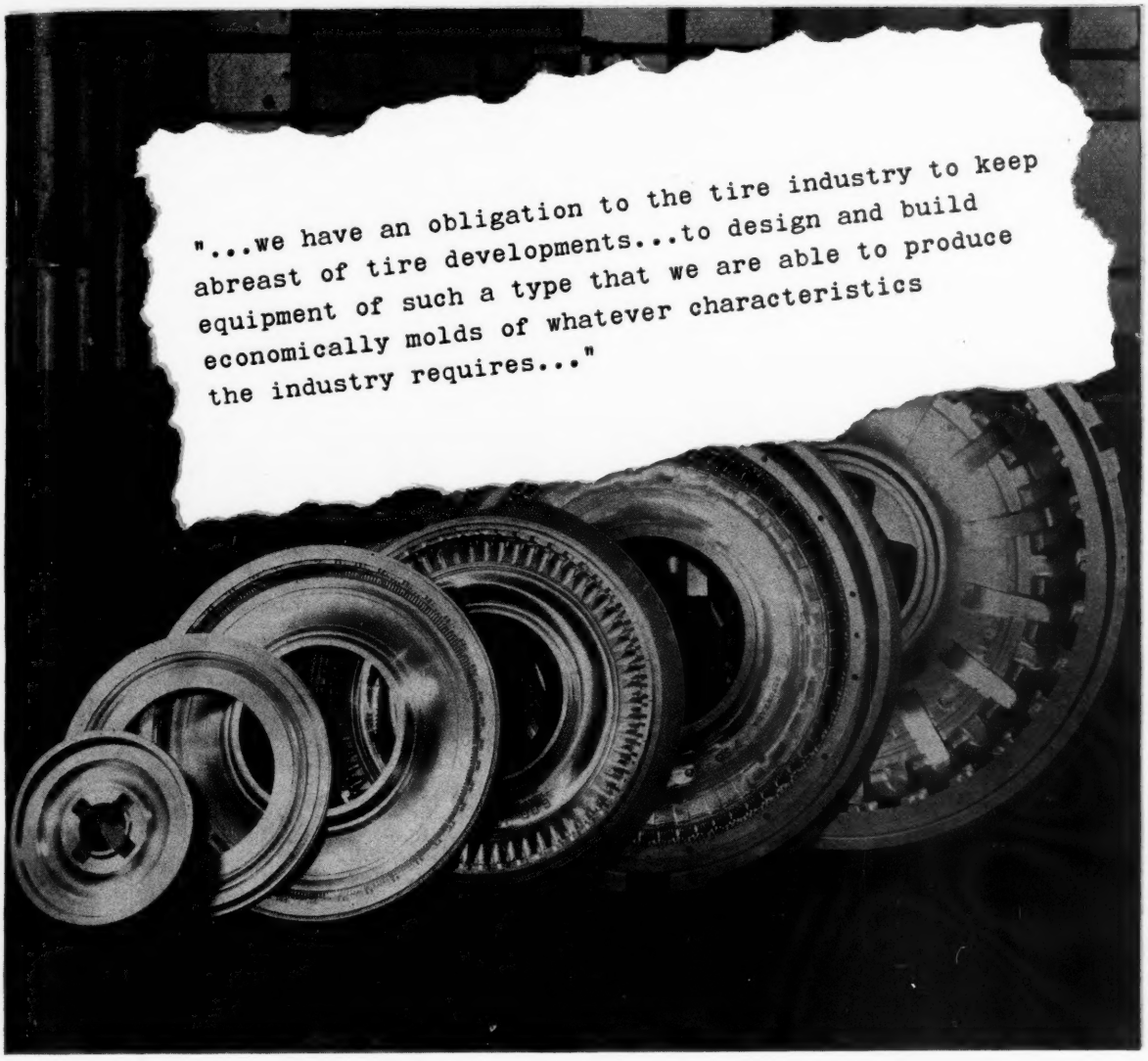
The Monet Plant seeks to coordinate efforts toward the desired objectives. To carry out the plan, a number of Modernization Commissions have been formed, each of which has for its task the study of a particular branch of industry, and, when necessary, sub-commissions are formed, which in turn may be sub-divided into working groups or sections.

The rubber industry is represented by a sub-commission of the Modernization Commission for Chemical Industries, and it is divided into three sections: the tire section, with M. Marin, of Kleber-Colombes, as president, assisted by M. Decaudin, of Etablissements Bergougnan, as committee reporter; the section for mechanical rubber, with M. Contejean, of S. I. T., as president, and M. Leclerc, of Hutchinson, as reporter; and the carbon black section, presided over by M. Laurent, of Compagnie Française de Raffinage.

Each of the two first sections must calculate the output and productive capacity of the works involved at January 1, 1948, the needs during 1948, 1949, and 1950, and then, after comparing the data obtained, outline measures to be taken in regard to equipment and modernization so as to insure that production meets requirements. The task of the carbon black section consists in studying the possibilities and means for the eventual production in France of carbon black.

The various commissions may call in experts for consultation whenever advisable.

Questions concerning rubber are also being studied by groups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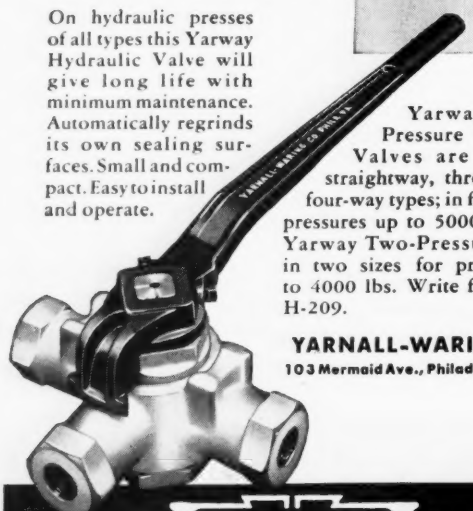

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in the plastics subcommission and by the Committee for High Frequency and Electronic Applications in Industry. The former body has been studying the problem of the production of synthetic rubber in France.

Study Rubber Roads

A French-Italian group, including a number of high officials and directors of important road-construction companies, visited Holland in June as guests of the Rubber Stichting, Delft, to study the methods employed by the Dutch for their rubber-asphalt road surfaces.

Rubber Stichting had arranged a meeting in Delft when two papers were presented. A. I. Plaizier spoke on the influence of rubber on the properties of asphalt, and M. van Houweninge discussed the properties of asphalt jointing containing rubber. A lively discussion followed, and subsequently the group visited the Thomson works in Rotterdam where were shown results obtained by the firm in the application of layers of asphalt mixed with rubber. The following day the party went to Amsterdam to inspect streets surfaced with rubber-asphalt compounds and also the experimental section laid near Schiphol ten years ago.

It is recalled that experiments in surfacing roads with rubber have also been made in France, the first dating back to 1929. At the time the aim was to improve roads embodying asphalts and similar materials by the incorporation of the highest possible percentage of pure natural rubber. These mixtures proved unsuitable.

About 1930 the Societe Chimique de la Route developed an asphalt-rubber emulsion employing latex, in which the proportion of pure rubber to asphalt, on a weight basis, ranged from 6% to 18%. The mixture, known as Micmell rubber, was laid on various more or less extensive experimental areas in the course of the next few years. All are said to have given excellent results; the advantages chiefly noted is the perfect adherence of the Micmell rubber to smooth bases and the flexible and non-slipping characteristics of the surface. Work with Micmell road coatings has now been stopped only because of the high costs involved; but it is indicated that this cessation is temporary.

Sabotage in Indo-China

In the uneasiness caused by the recent unfortunate developments in Malaya, the long succession of acts of sabotage that have been taking place in Indo-China tend to be overlooked—outside of France. But Indo-China is France's chief source of crude rubber and as such plays a vital part in the prosperity of both countries. The systematic efforts of subversive elements to destroy Indo-China's rubber industry are therefore cause for grave concern, especially in rubber circles. Already French rubber needs far exceed the amount of rubber that in the present circumstances is likely to be obtainable from Indo-China. The French rubber industry puts its requirements for the current year at 80,000 tons, against probable exports of only 40,000 to 45,000 tons out of a potential yield said to be 110,000 tons. Under these conditions France, hard pressed as she is for foreign currency, sees herself obliged to buy the balance of her rubber needs in Malaya or Netherlands India, for which pounds sterling or florins are required.

At the annual meeting of the higher council of the Institut Français du Caoutchouc held at Paris in May, 1948, these matters were discussed and a resolution was unanimously passed to call the attention of the government immediately and very firmly to the serious repercussions of the continuing underproduction of rubber in Indo-China on the economy and standard of living of both Indo-China and France and to express the grave concern of the French rubber industry over the general situation in Indo-China, where a select little group of Frenchmen are wearing themselves out in heroic efforts to safeguard rubber, the source of wealth for Indo-China and France and prime factor in future recovery and social progress.

Kleber-Colombes Firm Expanding

Production at Pneumatiques & Caoutchouc Manufacture, Kleber-Colombes, during the first five months of 1948 was 25% above that of the best months in 1947 and 50% over the prewar figure, the chairman, Robert Boyer, stated at the company's meeting, July 8. During the past financial period, covering 14 months (the report includes all of 1947 and January and February, 1948), the total quantity produced exceeded that of 1946 by 30% and of 1938 by more than 60% despite the work stoppages in November and December, 1947. The program of reconstruction and up-to-date reequipment, undertaken since the

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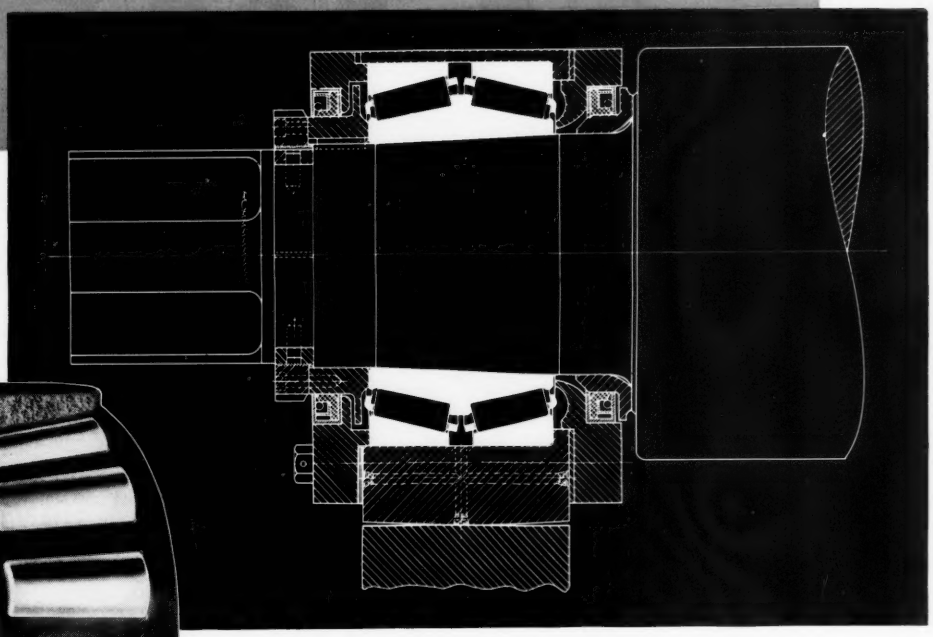

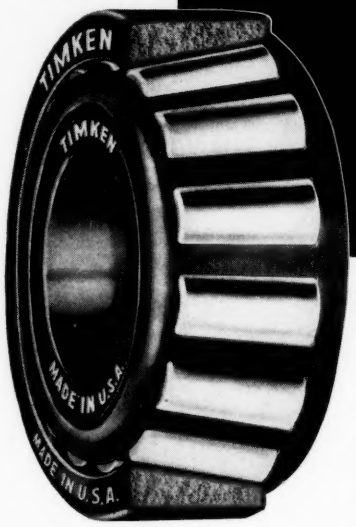

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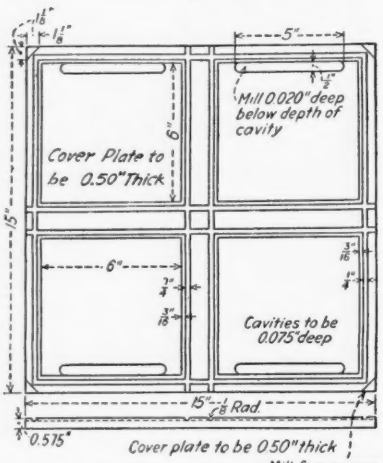
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liberation, has been carried out according to schedule. New storehouses for raw material and a new shop for preparing compounds are under construction at Colombes. It is already apparent that output will continue to increase in 1948, thanks to additional French and American equipment.

Work on the expansion and improvement of the Decize factory will be continued. Land and buildings have been acquired about 50 kilometers from Paris for the purpose of developing certain manufactures.

Steady progress of the company's subsidiary, Société Industrielle de Transmission Colombes Texrope (formerly Société Chatillon-Briare-Levallois) has necessitated an increase in its capital, and Kleber-Colombes has also subscribed, thus maintaining majority participation in this growing concern.

Net profit of Kleber-Colombes for the 14 months under review came to 91,006,449 francs; the dividend was fixed at 70 francs gross per old share (against 50) and 40 francs gross per new share.

ITALY

Preliminary figures issued by the Italian Central Statistical Bureau indicate that Italian exports of tires and inner tubes in the first five months of 1948 totaled 2,303 metric tons, against 591 tons in the corresponding period of 1947.

A Swiss paper learns that the Sapsa, a branch of the Pirelli concern, is now starting the production of synthetic resins.

Production of phenol and cresol resins in Italy increased by 75% in 1947 as compared with 1946; vinyl resins by 93%; acrylic and methacrylic resins by 92%; polystyrene by 27%; urea resins by 66%. The increase in output of other materials including celluloid and vinyl acetate was 100% as compared with 1946. In 1947 about 2,000 tons of phenol resins and 1,000 tons of urea resins were exported.

At the Milan Fair, held April 29 to May 16, 1948, exhibits of the plastics industry were housed in a special hall where manufacturers of raw materials, machines, and finished products of the plastic industry showed their wares. The big Montecatini firm, however, had its own building where could be seen, among many other products, polystyrol injection molding material known as "Stiroplasto" and the polyvinyl chloride based injection molding material sold under the name "Vipla." This firm also makes various types of nylon bristles.

In the special plastics building the firm of Th. Mohwinkel, Milan, featured a new molding material called "Urkerit," which is based on urea-formaldehyde mixed with an organic material. This product is said to yield parts that are comparatively elastic and can readily be drilled, planed, etc.

A number of Italian firms showed hydraulic injection molding machines of their own manufacture. This is said to be an entirely new departure, for before the war such machines were all imported, practically all from Germany.

Extrusion machines, one permitting the use of nozzles 30, 60, and 120 mm. diameter and the other adaptable for work on either rubber or plastics, were featured at the Milan Fair by two Italian manufacturers.

FOR FURTHER DETAILS, SEE AD ON PAGE 154

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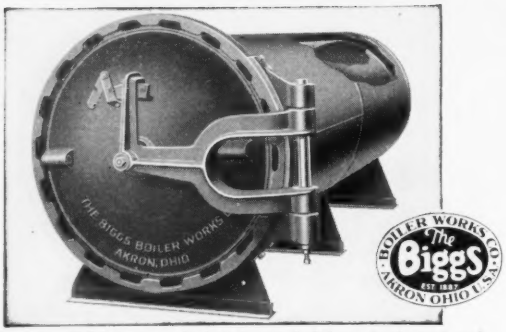

Fig. 17. Welded steam-jacketed, staybolt-less, horizontal vulcanizer with quick-opening door. All sizes; various working pressures. Low maintenance.

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GERMANY

Production of automobile and truck tires in the Bizonal Area of Germany is reported at 348,000 units for the first quarter of 1948, as compared with 130,000 units in the corresponding period of 1947. Total production of tires for 1947 was 906,000 units, against 852,000 units in 1946. The total for the year 1936 was 2,724,000 tires.

Past experience with and present possibilities of polyvinyl chloride, or Igelit, as it is called here, in the manufacture of footwear have been reviewed by H. Berger.[1] During the war Igelit PCU was used chiefly for making outsoles, following much experimentation to find suitable compounds. Formulae now used include about 50% of Igelit PCU, 35-40% of a Palatinol (ethyl phthalate), or a mixture of a Palatinol with tricresylphosphate and Mesamoll (sulfonphenolate of C_{12}—C_{15} hydrocarbons) as plasticizers, and a suitable filler. This compound is claimed to give a sheet with tensile strength of about 150 kg/cm, elongation of about 200%, and cold resistance of 15 to 20° C. Such soles are said to have proved durable even in severe winter weather, but a prerequisite is faultless attachment to the shoe uppers. It is noted that since the end of the war there has been a considerable decline in the production of polyvinyl chloride with corresponding cut in the output of the so-called P-soles.

Igelit has been used also as leather substitute for uppers either in the form of a film on a fabric backing or as an unsupported film. The latter is considered the less advantageous application because the unsupported film has poor impact resistance and nicks rather easily and, furthermore, is difficult to attach to the foundation. Latterly shoes, chiefly for summer wear, have been made from extruded, colored strips of Igelit and have proved very popular. While the method of manufacture is simple enough, attachment to the foundation is a problem here too.

It is suggested that injection molding might to some extent be applied to the manufacture especially of the lighter type of sandal and similar footwear. The dipping process, in which Igelit pastes are used, is employed for all kinds of galoshes and overshoes and also for wader-type boots which are used for industrial purposes.

Beside plasticized polyvinyl chloride, the stretched polyvinyl chloride sheet known as Luvitherm also finds a use in shoe uppers. Here the process seems to be to form a kind of webbing from colored bands of the material from which very attractive footwear is said to be produced. But once more, attachment to the shoe base offers difficulties.

[1] *Kunststoffe*, 38, 7, 135 (1948).

Testing GR-S Polymers

(*Continued from page* 204)

the specified procedure when exposed to ultra-violet light. The exposed, unlacquered area of the polymer is then compared with the standard, and the polymer rated as *good*, *fair* or *poor*.

STAINING. This property may be defined as the color imparted to a white lacquer by a polymer compounded according to the specified procedure and coated with the standard lacquer, when exposed to ultra-violet light. The exposed, lacquered area of the polymer is then compared with the standard, and the polymer rated as *good*, *fair*, or *poor*.

Acknowledgments

The authors wish to express their appreciation to R. D. Stiehler, of the National Bureau of Standards, for his cooperation in preparing samples of lacquer and ultra-violet light-sensitive paper E and to the Naugatuck Chemical Division of the United States Rubber Co. for the use of its Fade-Ometer. The work reported in this paper was carried out under the sponsorship of, and in collaboration with, the Office of Rubber Reserve, Reconstruction Finance Corp. Appreciation is expressed for the permission to publish this paper by the management of ORR and U. S. Rubber.

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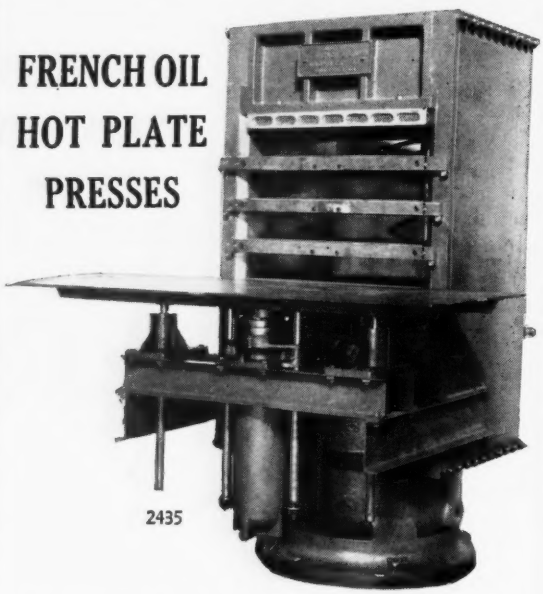

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Editor's Book Table

BOOK REVIEWS

"Vanderbilt Rubber Handbook. Ninth Edition, 1948." Edited by S. S. Rogers. R. T. Vanderbilt Co., 230 Park Ave., New York 17, N. Y. Cloth, 5½ by 8½ inches, 714 pages. Price, $7.50.

The first postwar edition of this well-known handbook for rubber technologists retains the high standards of quality reached in earlier editions and contains about 250 more pages than the 1942 edition. A number of new sections have been added, and some of the older ones amplified and revised.

It is interesting to note the broader viewpoint of the new edition in including the compounding of natural and synthetic rubbers as part of a unified section, with separate portions on the designing of the respective compounds of each type of rubber. Greatly increased importance is given to latex compounding, which now occupies 72 pages of text. The section includes all the test methods for latices developed by the Committee on Specifications for Government Synthetic Rubbers, Office of Rubber Reserve. Other subjects receiving considerably greater attention are textile testing, electronic processing, X-ray diffraction, flexible plastics, and injection molding. An interesting new section is devoted to the identification of rubber chemicals. The valuable section on test methods and equipment is little changed from the earlier edition. A selected list of books on rubber is given which might well have included also Mark and Whitby's "Advances in Colloid Science, Volume II," the new edition of Barron's "Modern Rubber Chemistry," the new edition of India RUBBER WORLD's "Compounding Ingredients for Rubber," the "1944 A.S.T.M. Symposium on the Applications of Synthetic Rubber," and the "1947 A.S.T.M. Symposium on Rubber Testing."

The last section of the handbook contains the tables and charts which have been found so useful in earlier editions. In addition to tensile tables and many others, one can even find the weight of United States silver coins and how to get to the Vanderbilt laboratory.

The company has performed a valuable service in the preparation of successive editions of these handbooks. The growth of the books in quantity and quality reflects the notable progress that has been made in the rubber industry in recent years.

LAWRENCE A. WOOD

"Modern Rubber Chemistry." Harry Barron. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. Cloth, 5¾ by 8¾ inches, 510 pages. Price, $7.50.

In his preface the author sets forth two aims for the book: (1) to explain the scientific principles behind rubber manufacture as at present understood; and (2) to write an educational work on the subject of natural rubber and its behavior. Unfortunately the first objective achieves far from satisfactory results; although the second does meet with some success. An analysis of the book can best be made from discussions of the component words of the title, "Modern Rubber Chemistry." Dealing first with the "modern" aspect, the first four parts of the book, comprising 23 chapters, cover topics which appeared in the 1938 edition. For the most part the subject matter is taken directly from the previous edition with the addition of scanty sentences and paragraphs designed to cover recent work. The inadequacy of this approach is shown by numerous mentions in the text of recent developments which show references dating back to 1930. In most cases the interval between the latest reference (about 1935) in the previous edition and the added recent references (about 1940-1942) is left untouched.

As for the word "rubber" in the title, the subject matter deals exclusively with natural rubber, and the omission of synthetic rubber is noted in the preface. The word "rubber" today no longer denotes only natural rubber, and its use in the title is misleading. While a detailed discussion of synthetic rubber would probably be beyond the scope of this book, its relation to natural rubber in the industry could have been worked into the text and done much to enhance the value of the book. Use of the word "chemistry" in the title is also misleading since the major portion of the subject matter covers rubber technology, and the discussion of rubber chemistry is quite brief and very much simplified. The technological aspects are concentrated in the fifth and new portion of this edition, but receive major attention throughout the text. In effect, the book will serve as a historical review of the natural rubber industry, with emphasis on British work, but will not be of value to anyone in the industry desiring information on modern developments.

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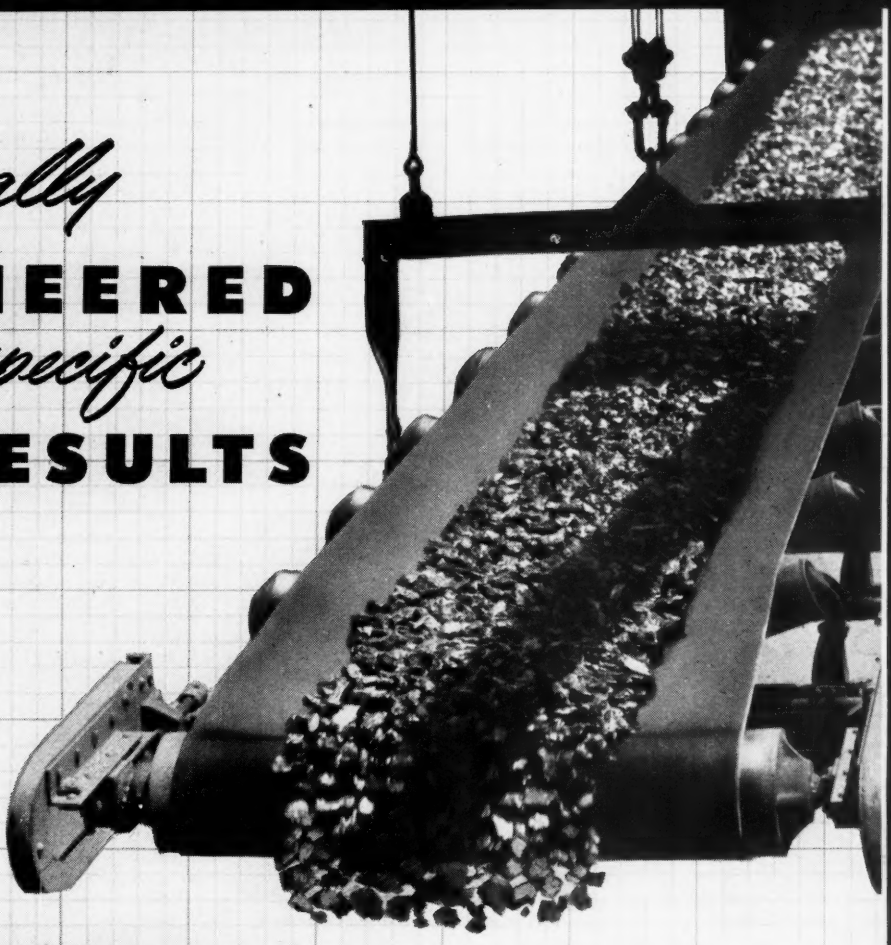

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"Textile Brand Names Dictionary." Textile Book Publishers, Inc., 303 Fifth Ave., New York, N. Y. Cloth, 6½ by 9½ inches, 388 pages. Price, $6.

A listing of more than 4,000 fiber, yarn, and cloth brand names and their trade marks, this dictionary will be of immense value to everyone in the textile field. The first portion of the book consists of an alphabetical listing of the trade names with their trade marks, serial numbers, dates of claim, the product or products which they represent, and the company owners. This information was obtained from the United States Patent Office and covers the years 1934 to the early part of 1947. The second part of the book is a classified section wherein the brand names are grouped under 12 main headings: coated fabrics; cotton piece goods; knit goods; linen, hemp, grass, and ramie piece goods; nylon goods and yarns; pile fabrics; rayon piece goods; ribbons, elastics, and narrow goods; silk and silk-mixture piece goods; synthetics; woolens and worsteds; and yarns and threads. The concluding section of the book is an alphabetical listing of companies and the page numbers on which their brand names appear in the main section.

NEW PUBLICATIONS

"Durez Check Chart." Durez Plastics & Chemicals, Inc., North Tonawanda, N. Y. This chart in slide-rule form gives the recommended Durez resin and its typical properties for various product applications; while the reverse side gives specific gravities of structural materials and several engineering tables.

"Taylor Technology." Vol. 1, No. 1. Summer, 1948, Issue. Taylor Instrument Cos., Rochester 1, N. Y. 32 pages. This first issue of the companys' new quarterly publication carries stories on the design and uses of Taylor control instruments, including a review of the use of controls for batch stripping unreacted styrene and butadiene from polymerized latex by means of automatically regulating pumps and valves.

"Natural Rubber Latex—Fundamentals Every User Should Know." Testworth Laboratories, Inc., 407 S. Dearborn St., Chicago 5, Ill. 12 pages. This bulletin gives a straightforward, nontechnical account of latex origin and types, the properties of concentrated latices, latex handling and storing, latex compounding, and latex cost and price calculations.

"Marvinol VR-10—Vinyl Resin: Properties, Uses and Processing Methods." The Glenn L. Martin Co., Baltimore 3, Md. 8 pages. This bulletin covers technical data on the properties of Marvinol VR-10, its compounding and processing methods, and compounding ingredients, including plasticizers, stabilizers, pigments, and lubricants. An extensive list of typical applications is appended.

"A New Synthetic Thickener, Polyco 296." Data Sheet P-6, August 30, 1948. American Polymer Corp., 101 Foster St., Peabody, Mass. 2 pages. An aqueous solution of the sodium salt of an acrylic acid copolymer, Polyco 296 is said to be a noncreaming thickener for natural and synthetic rubber latices that is fully saturated, alkali stable, and has high viscosities at low solids contents. General properties, including stability to acids and alkalis and viscosity, are discussed, and information appears on compounding Polyco 296 with latices and viscosities of Polyco-latex blends.

"Indonex Plasticizers in Heat Resistant Low Compression Set Natural Rubber Compounds." Circular No. 13-26, August 1, 1948. Standard Oil Co. (Indiana), 910 S. Michigan Ave., Chicago 80, Ill. 5 pages. Typical formulations and extensive test data are presented on the use of Indonex 638½ in natural rubber compounds containing varying quantities of either EPC or SRF black and varying amounts of iron oxide. The compounds are shown to have good heat resistance, low compression set, and good resistance to solvents.

"Indonex Plasticizers and Ground Scrap in Low Cost Compounds." Circular No. 13-28, August 15, 1948. 3 pages. This bulletin offers formulations and physical properties obtained with natural rubber compounds containing varying quantities of ground scrap. The addition of Indonex 638½ is shown to permit further cost reduction, facilitate milling, and permit control of hardness in both cured and uncured stocks.

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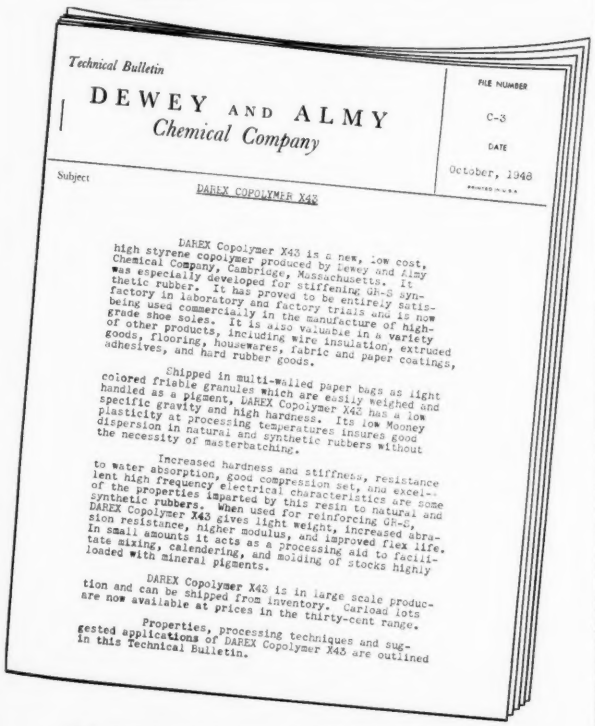

Technical Bulletin

DEWEY AND ALMY
Chemical Company

FILE NUMBER C-3
DATE October, 1948

Subject: DAREX COPOLYMER X43

DAREX Copolymer X43 is a new, low cost, high styrene copolymer produced by Dewey and Almy Chemical Company, Cambridge, Massachusetts. It was especially developed for stiffening GR-S synthetic rubber. It has proved to be entirely satisfactory in laboratory and factory trials and is now being used commercially in the manufacture of high-grade shoe soles. It is also valuable in a variety of other products, including wire insulation, extruded goods, flooring, housewares, fabric and paper coatings, adhesives, and hard rubber goods.

Shipped in multi-walled paper bags as light colored friable granules which are easily weighed and handled as a pigment, DAREX Copolymer X43 has a low specific gravity and high hardness. Its low Mooney plasticity at processing temperatures insures good dispersion in natural and synthetic rubbers without the necessity of masterbatching.

Increased hardness and stiffness, resistance to water absorption, good compression set, and excellent high frequency electrical characteristics are some of the properties imparted by this resin to natural and synthetic rubbers. When used for reinforcing GR-S, DAREX Copolymer X43 gives light weight, increased abrasion resistance, higher modulus, and improved flex life. In small amounts it acts as a processing aid to facilitate mixing, calendering, and molding of stocks highly loaded with mineral pigments.

DAREX Copolymer X43 is in large scale production and can be shipped from inventory. Carload lots are now available at prices in the thirty-cent range.

Properties, processing techniques and suggested applications of DAREX Copolymer X43 are outlined in this Technical Bulletin.

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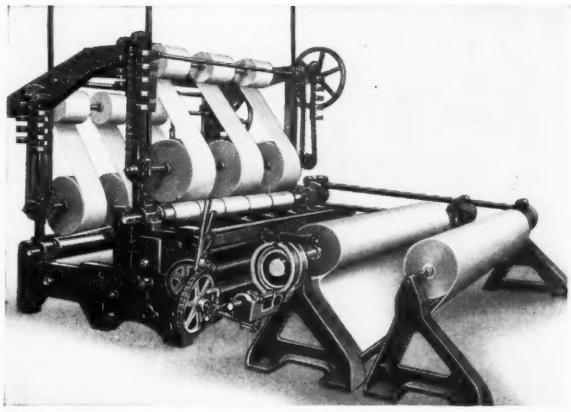

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"Barrett Rubber Softeners in Nitrile Rubber Compounding." Rubber Laboratory Release No. 9, September, 1948. Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 30 pages. Formulations and extensive laboratory test data in graph and tabular forms are given comparing the actions of dibutyl phthalate, Dispersing Oil 10, BRV, and Bardol as plasticizers in Butaprene NXM, Chemigum N-3, Hycar OR-15, and Perbunan 18 compounds.

"Santicizer 141 . . . the Safe Plasticizer." Monsanto Chemical Co., St. Louis 4, Mo. 14 pages. Santicizer 141, a phosphate-type plasticizer which gives fire resistant vinyl films, is described, and samples are enclosed of vinyl film plasticized with this material and with a standard flammable plasticizer. Data are presented on flammability, hardness, abrasion resistance, low temperature flexibility, volatility, water and oil resistance, and general compatibility of the plasticizer in vinyls.

"Koppers—The Company, Its Products and Activities." Koppers Co., Inc., Pittsburgh 19, Pa. 20 pages. This booklet gives the history of the company, describes the work of the different company divisions, and lists the various plants and sales offices and the company's products.

Publications of E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. **"Neoprene Vulcanizates,** Their Physical Properties and Aging Characteristics." Report 48-7, September, 1948. S. W. McCune, III, N. L. Catton, and W. N. Keen. 58 pages. This comprehensive and valuable report presents data on the effects of various amounts of carbon blacks and mineral fillers on the properties of neoprene vulcanizates. Also given in chart form are the changes in vulcanizate properties taking place upon aging under various conditions or immersion in petroleum hydrocarbons. Appendices include tables on volume loading of Neoprene Type GN and physical properties of carbon black loaded neoprene vulcanizates.

"The Neoprene Notebook." No. 41, September, 1948. 8 pages. This issue of the notebook contains stories on neoprene bonded fibers for cushioning and in sanding pads, neoprene parts in a new truck transmission, neoprene washers for construction nails, and others.

"Vistanex (Polyisobutylene) Processing and Compounding." Enjay Co., Inc., 15 W. 51st St., New York 19, N. Y. 46 pages. This manual offers extensive data, including charts and diagrams, on the properties of Vistanex, its addition to vulcanizable elastomers, and its formulation and use in plastic films and paper coatings, adhesives, chewing gum, caulking compounds, tank linings, asphalt composition, and emulsion. A bibliography and a list of trade-named materials suppliers are appended.

"A Year Book of Railroad Information. 1948 Edition." Eastern Railroad Presidents Conference Committee on Public Relations, 143 Liberty St., New York 6, N. Y. 96 pages. **"Increasing Productivity in Factory and Office."** American Management Association, 330 W. 42nd St., New York 18, N. Y. 8 pages. **"Model 40 Corrosion Resisting Durcopumps—Series M."** The Duriron Co., Inc., Dayton 1, O. 20 pages. **"Bi-Monthly Supplement to All Lists of Inspected Appliances, Equipment, Materials."** August, 1948. Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago 11, Ill. 96 pages.

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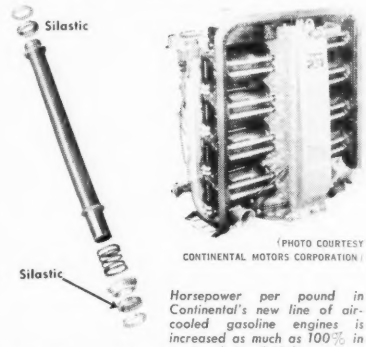

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Horsepower per pound in Continental's new line of air-cooled gasoline engines is increased as much as 100% in engines below 250 hp . . . more than 300% (down from 2400 to 777 lbs.) in the horizontally opposed 8 cylinder 250 hp engine shown above. In this type of engine, Silastic gaskets are essential parts of the standard push-rod and tube assembly.*

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Silastic solved this problem because it is more heat-stable and more resistant to hot oils and to permanent deformation at temperatures above 200° F. than any other resilient material. Use of engines in sub-zero weather is not restricted by these gaskets of Silastic 161 because they are serviceable from —90° to 500° F. For more information about Silastic, ask for data sheet No. F-5U.

†See Silicone News, Dec. 1947, for story on 50% reduction in size and weight of electric motors made possible by Dow Corning Silicone Insulation.

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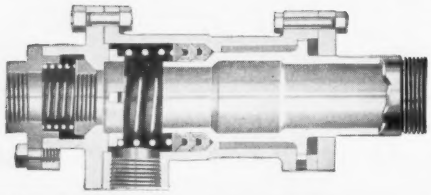

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FOR FURTHER DETAILS, SEE AD ON PAGE 154

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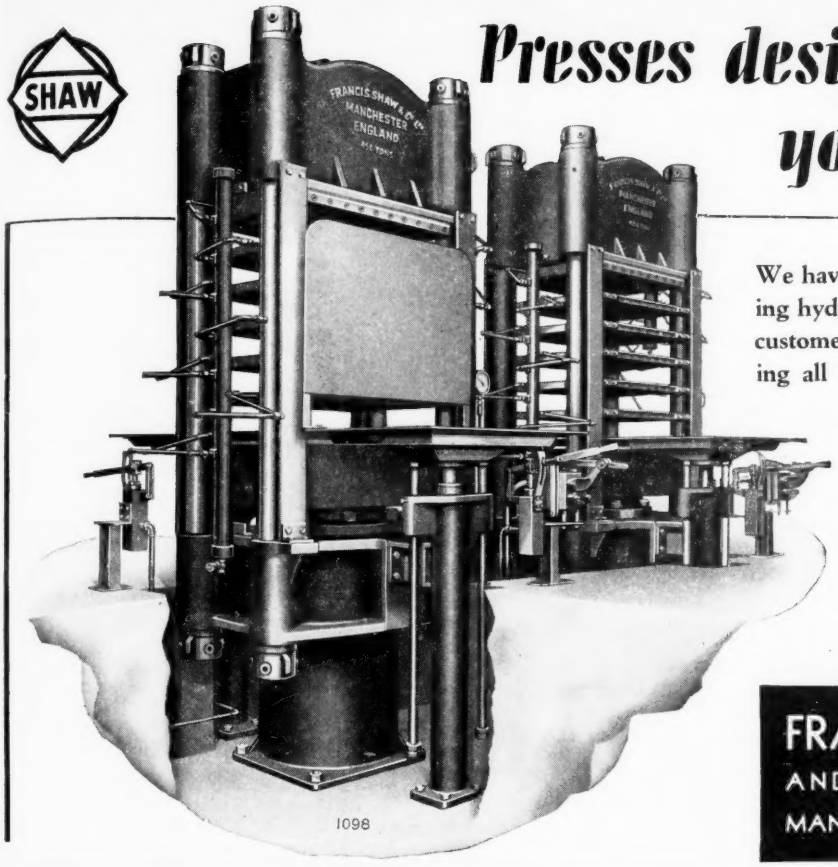

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Oct.	20.97	21.35	21.75	21.63	22.15	21.45
Nov.	20.97	21.30	21.72	21.61	22.09	21.42
Dec.	20.90	21.25	21.70	21.61	22.04	21.40
1949						
Jan.	20.90	21.22	21.64	21.45	21.96	21.31
Feb.	20.90	21.22	21.57	21.35	21.88	21.23
Mar.	20.90	21.26	21.50	21.30	21.85	21.15
Apr.	20.87	21.19	21.40	21.17	21.80	21.10
May	20.85	21.18	21.30	21.10	21.80	21.05
June	20.80	21.13	21.25	21.05	21.75	21.00
July	20.75	21.08	21.20	21.00	21.70	20.95
Aug.	20.70	21.03	21.15	20.95	21.65	20.90
Sept.	20.65	20.98	21.10	20.90	21.60	20.85
Oct.	20.60	20.93	21.05	20.85	21.55	20.80
Nov.	....	20.88	21.00	20.80	21.50	20.75
Dec.	....	....	20.95	20.75	21.45	20.70
Weekly sales vol., tons	3,660	1,140	1,660	1,110	1,220	1,380

No. 1 Contract

1949	Oct. 16	Oct. 23
Mar.	22.30	21.80
Apr.	22.25	21.75
May	22.20	21.70
June	22.12	21.60
July	22.05	21.50
Aug.	21.95	21.40
Sept.	21.85	21.30
Oct.	21.80	21.25
Nov.	21.75	21.20
Dec.	21.70	21.15
Weekly sales vol., tons	570	1,010

THE crude rubber market on the New York Commodity Exchange was rather quiet last month with most activity seemingly confined to professional trading and rumors of Russian and United States plans to purchase Ceylon rubber. October 11 saw the start of trading in the new No. 1 R.S.S. contract which, despite optimistic expectations, failed to show much activity during the remainder of the month. Traders explained that no matter how good the new contract may be, activity will remain small unless there is some margin for speculation. With the United States and Russia absorbing all surplus rubber for stockpiling, price fluctuations have been reduced, with consequent narrowing of speculative opportunities.

Early in October it was revealed that a Russian trade delegation has been negotiating with the Ceylon High Commissioner in London for a reported 30,000 tons of rubber for shipment this year and the entire Ceylon rubber output next year. A few days later reports arose that the United States had made the Ceylon Government an offer for its entire rubber production. Although widely discussed, neither report appeared to have much effect on the market at first, but in conjunction with reports of a first decline in Singapore rubber stocks in many months finally resulted in a price increase midway in October. Singapore reported that dealer and port stocks at the end of September had dropped to 57,954 long tons, against 59,888 long tons on August 31. Further support to the rising market came from reports of increased domestic shipments of tire casings and reduced inventories.

A reaction set in during the third week of October, and prices declined following reports that rubber production in Netherlands India this year will exceed 400,000 tons, as compared with a Rubber Study Group forecast of 370,000 tons, and may reach 500,000 tons next year. Contributing to the price decline was the report from Malaya that September rubber production amounted to 64,202 long tons, the second largest total of the year, and that October production would also be quite large.

As for actual price quotations on the Exchange, December futures on the standard contract started the month at 21.70¢, reached a high of 22.13¢ on October 14, and closed the month at 20.85¢. March futures in the standard contract were 21.50¢ on October 1, attained a high of 21.92¢ on October 14, and ended the month at 20.65¢. In the new No. 1 contract, March futures opened at 22.08¢ on October 11, reached a high of 22.34¢ on October 14, and closed at 21.15¢ on October 29. Total volumes of sales during October on the Exchange were 6,420 tons in the standard contract and 2,680 tons in the No. 1 contract, for a combined total of 9,100 tons.

New York Outside Market

WEEK-END CLOSING PRICES

	Aug. 28	Sept. 25	Oct. 2	Oct. 9	Oct. 16	Oct. 23
No. 1 R.S.S.:						
Oct.	22.75	22.50	23.00	22.38	22.63	22.38
Nov.-Dec.	22.63	22.38	22.63	22.25	22.50	22.00
Jan.-Mar.	22.38	22.25	22.38	22.13	22.38	21.88
Apr.-June	21.75	22.00	22.13	22.00	22.25	21.88
No. 3 R.S.S.	20.00	20.75	20.88	20.63	20.88	20.38
No. 2 Br.	17.00	16.50	16.50	16.00	16.50	16.00
Flat Bark	11.50	11.38	11.50	11.50	11.50	11.38

THE New York Outside Market showed moderate activity in rubber trading during October and a relatively firm market tone. Factory demand and purchasing continued on a day-to-day basis with occasional spurts in interest. Price movements were narrow, and the market was ridden with the rumors affecting the Commodity Exchange. Some weakness developed toward the end of the month with reports of increased rubber production in the Far East and consequent expectations of larger supplies being received here by the year-end.

The spot price for No. 1 R.S.S. began the month at a high of 23.00¢, hovered between 22.75 and 22.38¢ during most of October, and closed at 21.50¢ on October 29. No. 3 R.S.S. opened the month at 20.88¢, reached a high of 21.00¢ on October 14 and 18, and ended the month at 20.25¢. No. 2 Brown fluctuated between 15.50¢ and 16.75¢ during the month, while spot prices for Flat Bark remained in the 11.25-11.75¢ range throughout October.

Latices

CONSUMPTION of *Hevea* latex is resuming its earlier level of 2,000 tons a month, and the demand for GR-S latex has also picked up, according to Arthur Nolan, Latex Distributors, Inc., writing in Lockwood's October *Rubber Report*. Mr. Nolan gives estimated August imports of *Hevea* latex as 2,395 long tons, dry weight; consumption, 1,964, long tons; and month-end stocks, 11,216 long tons. Production of GR-S latex in September is estimated at 1,632 long tons, dry weight. Production of *Hevea* latex in Malaya has been substantially reduced by practically all producers; while production of the latex in Sumatra has been resumed on a small scale, in drum shipments, by one prewar producer.

The very large latex stocks hanging over the market continue to depress prices, which remained at previous levels, but these stocks should decrease when reduced production begins to take effect and expected greater world consumption is realized. The current price of *Hevea* latex, 27.75-28.25¢ a pound and its narrow differential over No. 1X Ribbed Smoked Sheet make the production of high-quality latex unattractive. Continuance of the present sheet rubber prices may prompt action toward a higher latex price.

Fixed Government Prices*

Guayule	
Guayule *(carload lots)*	$0.17½
Latex†	
Hevea, normal *(tank car lots)*	.30¼
Centrifuged *(tank car lots)*	.32½
GR-S, Type 2 *(tank car lots)*	.18½‡
(Carload, drums)	.268
(Less carload, drums)	.273
Types 3 and 4 *(tank car lots)*	.18½‡
(Carload, drums)	.26
(Less carload, drums)	.26½
Type 5 *(tank car lots)*	.20½‡
(Carload, drums)	.27¼
(Less carload, drums)	.27¾
Plantation Grades	
No. 1X Ribbed Smoked Sheets	.23
1X Thick Pale Latex Crepe	.29
1 Thick Pale Latex Crepe	.29
2 Thick Pale Latex Crepe	.28½
3 Thick Pale Latex Crepe	28¾
1X Thin Pale Latex Crepe	.29
1 Thin Pale Latex Crepe	.29
2 Thin Pale Latex Crepe	.28½
3 Thin Pale Latex Crepe	.28¼
Liberian A	.28⅝
AA	.29
RCMA Watermarked Crepe No. 16	.37⅞
17	.32⅜
18	.30⅞
Sole Crepe Trimmings	.28½
No. 1X Thin Pale Latex Crepe Trimmings	.28½
1X Brown Crepe	.21⅞
2X Brown Crepe	.21⅝
2 Remilled Blankets (Amber)	.21¾
3 Remilled Blankets (Amber)	.21⅝
Rolled Brown	.18§
Synthetic Rubber	
GR-M (Neoprene GN)	.32
GR-M-10 (Neoprene GN-A)	.32
GR-S (Buna S)	.18½
GR-I (Butyl)	.18½
Wild Rubber	
Upriver Coarse (crude)	.12⅝
(Washed and dried)	.20⅛
Islands Fine (crude)	.14⅝
(Washed and dried)	.22½
Caucho Ball (crude)	.11⅝
(Washed and dried)	.19½
Mangabiera (crude)	.08½
(Washed and dried)	.18

* For a complete list of all grades of dry rubbers see Rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended.
† Prices per pound total solids.
§ Plus average freight charge of 0.75¢ per pound dry weight.

SCRAP RUBBER

THE persistent dullness of the scrap rubber market was again evident during October as domestic dealers reported very little activity in either the East or at Akron. Some factors were said to be buying up peelings for eventual shipment overseas, but even this business was slight.

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Reinforcing Fillers and Inerts

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THE ALUMINUM FLAKE COMPANY
AKRON 14, OHIO
Manufacturers of
ALUMINUM FLAKE
A COLLOIDAL HYDRATED ALUMINUM SILICATE
REINFORCING AGENT for
SYNTHETIC and NATURAL RUBBER
New England Agents Warehouse Stocks
BERLOW AND SCHLOSSER CO.
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QUALITY **INTEGRITY** **SERVICE**
67 YEARS WITHOUT REORGANIZATION

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There were reports that 4,200 tons of scrap rubber were sold to the Japanese Board of Trade in August, about 4,300 tons in September, and that another sale would be made in the near future. Trade sources believe that Japan will purchase close to 4,000 tons per quarter.

The only solution to the apathetic scrap rubber market is said to lie in exports. There is wide potential interest in Europe and the Far East, but monetary problems are almost insurmountable. China, among others, is reported willing to take 100 times as much scrap rubber as it is now taking if currency difficulties could be straightened out.

No changes were made in scrap rubber prices during October, and the following are dealers' buying prices for scrap rubber, in carload lots, delivered to mills at points indicated:

	Eastern Points (Per Net Ton)	Akron, O. (Per Net Ton)
Mixed auto tires	$11.50	$12.50
S-A. G passenger (natural)	nom.	nom.
Truck (natural)	nom.	nom.
Peelings (natural), No. 1	50.00	50.00
2	31.00	31.00
3	29.00	29.00
	(¢ per Lb.)	
Mixed auto tubes	4.00	4.00
Red passenger tubes	7.00	7.00
Black passenger tubes	4.50	5.00
Truck tubes	4.00	4.75
Mixed puncture-proof tubes	0.50	0.50
Air brake hose	nom.	nom.

RECLAIMED RUBBER

THE improvement in reclaimed rubber demand evident during September continued in October, with sales at high levels. Production remained at a high rate, and exports showed a slight improvement. Despite this improved business in the industry, there were no further changes in reclaim prices.

Final July and preliminary August figures on the domestic reclaimed rubber industry are now available. Production of reclaim during July totaled 17,712 long tons; consumption, 19,291 long tons; exports, 712 long tons; and month-end stock, 34,302 long tons. Preliminary figures for August show a production of 20,041 long tons; consumption, 22,441 long tons; exports, 643 long tons; and end-of-month stocks, 32,326 long tons.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8.5 / 9
Peel	1.18-1.20	8.5 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.75
Red	1.20-1.22	14 /14.5
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

RAYON

DOMESTIC shipments of rayon during September totaled 89,600,000 pounds, 5% below the August level. Nine-month domestic deliveries reached 817,000,000 pounds, 17% above the corresponding 1947 period shipments. September filament yarn shipments amounted to 68,300,000 pounds, consisting of 44,400,000 pounds of viscose and cupra and 23,900,000 pounds of acetate; while staple plus tow deliveries totaled 21,300,000 pounds. Rayon stocks held by producers at the end of September were set at 15,400,000 pounds, consisting of 7,500,000 pounds of viscose and cupra yarn, 3,100,000 pounds of acetate yarn, and 4,800,000 pounds of staple plus tow.

No changes occurred in rayon tire yarn and fabric prices in October, and current prices are listed below:

Rayon Fabrics

Tire Yarns		
1100/480	$0.55	/ $0.56
1100/490	.57	
1150/490	.57	
1650/720	.54	/ .56
1650/980	.56	
1900/980	.56	
2200/960	.55	
2200/980	.55	
Tire Fabrics:		
1100/490/2	.71	
1650/980/2	.685	/ .70
2200/980/2	.67	

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE
WEEK-END CLOSING PRICES

Futures	Aug. 28	Sept. 25	Oct. 2	Oct. 9	Oct. 16	Oct. 23
Dec. 1949	30.71	30.89	31.20	31.19	31.17	31.40
Mar.	30.67	30.64	30.96	31.06	30.97	31.26
May	30.45	30.41	30.65	30.79	30.72	31.02
July	30.05	29.67	29.68	29.64	29.41	29.80
Oct.	26.91	27.68	27.70	27.52	27.41	27.67
Dec.	26.73	27.53	27.52	27.35	27.22	27.45

TRADING on the New York Cotton Exchange during October was thin, with prices steady, although moving in a very narrow range. In general the market was quiet, and most of the activity consisted of hedging and professional trading. The market appears to be following the recent pattern of backing and filling; prices move high enough to bring out some cotton, and the rise causes mills to move out of the market as soon as their limits are reached. Mills are content to continue their hand-to-mouth purchasing policies, relying on the pressure of a 15,000,000-bale crop to bring values down. Some price increases took place during the third week of the month on the basis of foreign fixations against ECA buying. When these purchases failed to materialize, increased hedging and nervous realizing sales sent prices down during the final week of October.

The 15/16-inch middling spot price began the month at 32.23¢, fluctuated near the 32.10¢ level for the next two weeks, reached a high of 32.27¢ on October 20, then dropped to end the month at 31.50¢. December futures prices showed corresponding movement, starting the month at 31.22¢, hovering between 31.12 and 32.27¢ for two weeks, reaching a high of 31.49¢ on October 20, and ending the month at 31.02¢.

Fabrics

Fairly brisk selling featured the wide industrial gray goods market during October, as selling houses reported production sold well into November. Chafers in the single filled construction for the tire trade were active in November. Hose and belting ducks sold in moderate quantities, and the market was slowed by the loss of a large export market due to dollar difficulties. Broken twills and drills for the coating trade were bought as far ahead as early December at unchanged prices.

In the general gray goods field, drills and twills did not move readily. Mills quotations were unsettled and nominal, as sales under the market prices were made where fairly large amounts of goods were concerned. Print cloth prices continued downward and reached the last OPA ceiling levels. A stiffer front toward further price cuts was in evidence, and a general feeling of firmness pervaded the print cloth market as the month ended.

January and February business was done in several of the osnaburg constructions, with major stimulus coming from the bag trade. Spot goods were almost unobtainable, and shortages in several constructions were still acute. Sheetings were moderately active throughout the month, and purchases were made as far forward as the first quarter of 1949. In the rainwear industry the 38½-inch 64x60 5.35 print cloth was priced at 15.75¢ for nearby delivery; while the 64x60 5.35 bombazine was quoted at about 22.5¢ for delivery in one month.

Trade Marks

(Continued from page 242)

rubber supplies. H. O. Canfield Co., Bridgeport, Conn.

440,509. **Bombshell.** Fountain pens. Reynolds Pen Co., Chicago, Ill.

440,524. **Bestmaid.** Balls. New York Merchandise Co., Inc., New York, N. Y.

440,542. Representation of a triangle containing the word: **"Parko."** Rubber lubricant. Park Chemical Co., Detroit, Mich.

440,614. **Dorco.** Toys. Hungarian Rubber Goods Factory, Ltd., Budapest, Hungary.

440,617. **Twylex.** Elastic fabrics. John Heathcoat & Co., Tiverton, Devon, England, assignor to John Heathcoat & Co., Inc., New York, N. Y.

440,623. **Prox-Mesh.** Plastic adherent film. Pyroxlyn Products, Inc., Chicago, Ill.

440,634. **Parkote.** Plastic coated wire. Plastoid Corp., New York, N. Y.

440,636. **Vanfre.** Chemical releasing agent for rubber articles. R. T. Vanderbilt Co., Inc., New York, N. Y.

440,638. **Bronco.** Wire and extension cords. Western Insulated Wire Co., Los Angeles, Calif.

440,641. **Bar-Win.** Suspenders. J. Barlow & Co. (NOTTM), Ltd., Beeston, England.

440,680. Representation of an automotive shock absorbing device accessory. Auto repair kits. Anchor Rubber Products, Inc., Cleveland, O.

440,715. **The Norm Sure-Flush.** Hose. G. A. Norman, doing business as the Norm Mfg. Co., Des Moines, Iowa.

440,729. **Bubble Gum.** Raincoats. Spatz Bros., Inc., New York, N. Y.

501,270. **Leatheroid.** Artificial leather. American Finishing Co., Memphis, Tenn.

501,559. **Stafast.** Rubber-impregnated fabric. Stedfast Rubber Co., Inc., Mattapan, Mass.

501,561. **Barrett.** Footwear. General Shoe Corp., Nashville, Tenn.

501,562. **Volunteer Brand.** Coated upholstery material. United States Rubber Co., New York, N. Y.

501,582. **P-100.** Tires. Pennsylvania Rubber Co., Jeannette, Pa.

501,608. **Razzle Dazzle.** Footballs, basketballs, football helmets, etc. Mortimer Newman Co., also doing business as Moneco Co., New Haven, Conn.

501,609. **Yale.** Footballs, basketballs, punching bags, etc. Mortimer Newman Co., also doing business as Moneco Co., New Haven, Conn.

501,640. **EA.** Windshield wipers. E. A. Laboratories, Inc., New York, N. Y.

501,656. **Marvelfilm.** Artificial leather. Textileather Corp., Toledo, O.

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Our products are engineered to fill every need in natural and synthetic rubber compounding wherever the use of vulcanized oil is indicated.

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320 BROADWAY

NEW YORK

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$1.00 irr.	Oct. 19	Oct. 8
Baldwin Rubber Co.	Com.	0.05 ext.	Oct. 25	Oct. 15
	Com.	0.15 q.	Oct. 25	Oct. 15
Boston Woven Hose & Rubber Co.	Com.	4.00 ext.	Nov. 26	Nov. 15
	Com.	0.50 q.	Nov. 26	Nov. 15
Converse Rubber Co.	1st Pfd.	0.25 q.	Oct. 8	Oct. 1
	2nd Pfd.	0.20 q.	Oct. 8	Oct. 1
Crown Cork & Seal Co., Inc.	Com.	0.50 q.	Nov. 15	Oct. 15
Dayton Rubber Co.	Com.	0.30	Oct. 25	Oct. 11
	"A"	0.50 q.	Oct. 25	Oct. 11
Detroit Gasket & Mfg. Co.	Com.	0.12½	Oct. 25	Oct. 12
General Electric Co., Ltd.	Com.	7½% extra	Nov. 5	Sept. 30
	Com.	10% final	Nov. 5	Sept. 30
Goodall Rubber Co.	Com.	0.15	Nov. 15	Nov. 1
Goodyear Tire & Rubber Co.	Com.	1.00 q.	Dec. 15	Nov. 15
	Pfd.	1.25 q.	Dec. 15	Nov. 15
Gro-Cord Rubber Co.	Com.	0.10	Sept. 30	Sept. 20
Johnson & Johnson	Com.	5% stock	Nov. 15	Oct. 25
Lee Rubber & Tire Corp.	Com.	1.50 ext.	Oct. 28	Oct. 15
	Com.	0.50 q.	Oct. 28	Oct. 15
Link Belt Co.	Com.	1.00 ext.	Dec. 1	Nov. 3
	Com.	1.00 q.	Dec. 1	Nov. 3
O'Sullivan Rubber Corp.	Pfd.	0.25 q.	Oct. 1	Sept. 15
Thermoid Co.	$2.50 Cv. Pfd.	0.62½ q.	Nov. 1	Oct. 25

United States Rubber Statistics—July, 1948

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Total	Distribution: Consumption	Distribution: Exports	Stocks
Natural rubber, total	0	*60,121	60,121	46,977	466	117,233
Natural latex, total	0	3,654	3,654	1,792	0	11,213
Natural rubber and latex, total	0	63,775	63,775	48,769	466	128,446
Synthetic rubber, total	† 39,898	9	41,276	34,511	257	96,211
	‡ 1,369					
GR-S	† 33,275	0	33,309	27,008	63	§78,219
	‡ 34					
Butyl	† 5,066	9	5,075	4,707	5	10,061
Neoprene	† 1,557	0	2,089	2,251	121	5,528
	‡ 532					
Nitrile	‡ 803	0	803	545	68	2,403
Natural rubber and latex, and synthetic rubber, total	41,267	63,784	105,051	83,270	723	224,657
Reclaimed rubber	17,712	0	17,712	19,291	712	34,302
Grand Totals	58,979	63,784	122,763	102,561	1,435	258,959

*Includes adjustment of -48 tons applicable to May, 1948.
†Government plant production.
‡Private plant production.
§Includes 71 tons shipped for export, but not cleared.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory, August, July, 1948; First Eight Months, 1948-1947

	1948 August	1948 % of Change from Preceding Month	1948 July	1948 First Eight Months	1947 First Eight Months
Passenger Casings					
Shipments					
Original equipment	1,884,121		1,927,718	13,977,715	12,606,593
Replacement	4,636,782		4,591,659	29,471,255	34,917,710
Export	55,061		40,599	438,324	1,089,568
Total	6,575,964	+ .24	6,559,976	43,887,294	48,613,871
Production	5,768,614	+ 4.57	5,516,349	45,889,683	50,926,378
Inventory end of month	7,462,765	− 9.59	8,253,829	7,462,765	3,904,743
Truck and Bus Casings					
Shipments					
Original equipment	405,751		450,919	3,677,626	3,708,418
Replacement	772,331		765,078	5,204,228	6,354,373
Export	80,837		89,971	779,361	1,120,225
Total	1,258,919	− 3.60	1,305,968	9,661,215	11,183,016
Production	1,193,942	+ 3.30	1,155,797	10,000,120	12,049,930
Inventory end of month	1,872,354	− 4.12	1,952,751	1,872,354	1,559,531
Total Automotive Casings					
Shipments					
Original equipment	2,289,872		2,378,637	17,655,341	16,315,011
Replacement	5,409,113		5,356,737	34,675,483	41,272,083
Export	135,898		130,570	1,217,685	2,209,793
Total	7,834,883	− .40	7,865,944	53,548,509	59,796,887
Production	6,962,556	+ 4.35	6,672,146	55,889,803	62,976,308
Inventory end of month	9,335,119	− 8.54	10,206,580	9,335,119	5,464,274
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,292,212		2,364,715	17,660,447	16,310,845
Replacement	4,522,117		4,364,685	27,948,132	29,810,077
Export	102,811		78,014	742,457	1,905,957
Total	6,917,140	+ 1.61	6,807,414	46,351,036	48,026,879
Production	6,638,552	+15.46	5,749,632	47,138,042	52,007,414
Inventory end of month	8,532,660	− 2.60	8,760,344	8,532,660	6,837,199

Note: Cumulative data on this report include adjustments made in prior months.
Source: The Rubber Manufacturers' Association, Inc.

Financial

(*Continued from page 238*)

Eagle-Picher Co., Cincinnati, O., and consolidated subsidiaries. Nine months ended August 31: net profit, $3,288,031, equal to $3.70 a common share, contrasted with $3,133,730, or $3.52 a share, in the corresponding period last year; sales, $55,144,300, against $57,220,441.

Dow Chemical Co., Midland, Mich., and subsidiaries. Quarter ended August 31, 1948: net profit, $6,393,456, equal to $1.13 a common share, against $4,396,398, or 79¢ a share, in the 1947 period.

Boston Woven Hose & Rubber Co., Cambridge, Mass. Year ended August 31, 1948: net earnings, $1,008,796, equal to $11.21 a common share, contrasted with $1,312,848, or $14.74 a share, in the preceding fiscal year; net sales $17,591,385, against $15,671,957; taxes, $859,574, against $1,000,007; current assets, $6,749,205, current liabilities, $1,506,134, against $7,107,268 and $1,729,362, respectively, on August 31, 1947.

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Berna Corp., 116-23 Jamaica Ave., Richmond Hill, N. Y. President: P. M. Orley. To secure and distribute all types of plastic films and raw materials.

Dry-Ees Products, Inc., 152 Market St., Paterson, N. J. Stock, $125,000, divided into 1,250 shares at $100, with 250 shares at $25,000 as preferred stock, and 1,000 shares at $100,000 as common stock. Incorporators: W. J. Hunziker, O. F. Lutolf, and A. W. Round. To manufacture and deal in rubber products.

Sider Rubber Co., Akron, O. Capital, $1,000, or 10 shares of par value $100 common. Incorporators: G. M. Werth, J. R. Guth and G. D. Bryan. To deal in scrap rubber.

South Siani, Inc., 48 Wall St., New York, N. Y. Capital, $400,000. Director: I. S. Butter. To deal in rubber materials.

State Rubber Corp., New York, N. Y. Capital, 200 shares no par value. D. Waizer, 1111 Park Ave., New York. General merchandise.

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The Commercial Intelligence Branch, United States Department of Commerce, Washington, D. C., recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms from this Branch and from Department of Commerce field offices at $1 a list for each country.

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Plastic Material Manufacturers and Molders, Laminators, and Fabricators of Plastic Products—Egypt and Cyprus; Algeria; France; Venezuela.

Rubber Exporters—Netherlands India.

Rubber Stamps and Stencils (Mimeograph) Manufacturers—Norway; Switzerland; Union of South Africa; Spain; Portugal.

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Allow nine words for keyed address.		*Replies forwarded without charge*

Address All Replies to New York Office at 386 Fourth Avenue, New York 16, N. Y.

SITUATIONS OPEN

RUBBER RESEARCH CHEMIST

Alert young chemist, Ph.D level with five to ten years of suitable research experience preferred, to plan and supervise the execution of research projects involving the chemistry and formulation of rubber and rubber-like materials. Opportunities for professional growth, individual initiative, and economic advancement are limited only by the capabilities of the individual. All inquiries acknowledged promptly and treated confidentially. Please address replies directly to

BATTELLE MEMORIAL INSTITUTE

Industrial and Scientific Research

505 King Avenue, Columbus 1, Ohio

MAN TO TAKE CHARGE OF MILL ROOM AND PRESS ROOM operations in miscellaneous molded rubber plant, located in New Jersey. Must be experienced and capable of lining up production in both departments. Salary will be commensurate with ability. Write, giving complete details. Address Box No. 228, care of INDIA RUBBER WORLD.

PROCESS CHEMIST EXPERIENCED IN RUBBER COMPOUNDING and production of dipped items. Right man will eventually run rubber production of Michigan firm prominent in its field. Salary commensurate with ability. Our employes know of this advertisement. Address Box No. 229, care of INDIA RUBBER WORLD.

TECHNICAL SUPERINTENDENT FOR LATEX DIPPING AND molded products with established manufacturer on Eastern Seaboard. Must be entirely familiar and have extensive experience in latex dipping and blown gas ball production. Good opportunity for right party. Write in detail past experience and salary expected. All replies will be kept confidential. Address Box No. 230, care of INDIA RUBBER WORLD.

SUPERINTENDENT FOR MECHANICAL RUBBER GOODS DIVISION of tire company located in Ohio. Must be experienced in molded and extruded production. Good opportunity for right party. Write in detail past experience and salary expected. Address Box No. 240, care of India RUBBER WORLD.

REPRESENTATIVES WANTED — RUBBER COMPOUNDING resins for use in synthetic and natural rubbers; also liquid urea resins for latices. Territories, Manhattan and upper New York State. Salary or commission basis. Address Box No. 242, care of INDIA RUBBER WORLD.

WANTED: CHEMIST WITH FAIR KNOWLEDGE OF GENERAL rubber compounding. Preference will be given to man with tire factory experience and some knowledge of plastics. A permanent job with old-established firm not in rubber manufacturing business. Address Box No. 243, care of INDIA RUBBER WORLD.

GRANULATED CORK

FOR EXTENDING RUBBER

SOUTHLAND CORK COMPANY

P. O. BOX 868 NORFOLK, VA.

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CHEMIST, RUBBER, LATEX, MECHANICAL GOODS, VINYLITE sheeting. Experienced compounding, supervision. Address Box No. 231, care of INDIA RUBBER WORLD.

TECHNICAL SALES—TIRE AND AIRCRAFT MECHANICAL rubber and resin development and manufacture. B.S. 1942. Consider supervisory or consulting. $6,000. Address Box No. 232, care of INDIA RUBBER WORLD.

RUBBER CHEMIST, M.I.T., 1932, 10 YEARS' RUBBER COMpounding experience tire, tube, insulating compounds, natural and synthetic. Primarily research. Five years in charge of braided fabric laboratory. Patents. Desires research or administrative position. Available immediately. Address Box No. 233, care of INDIA RUBBER WORLD.

DEVELOPMENT AND PRODUCTION CHEMIST — OVER 20 years' experience in fabric coating, paper treatment, with latex, natural and synthetic rubber, all types resins; extensive plastic and rubber molding; textile processing. Also diversified chemical, technical research work. Broad engineering background. Executive management, production, and technical service experience. Patents registered. Age 49; B.S. Chem.; available short notice. Address Box No. 234, care of INDIA RUBBER WORLD.

RUBBER EXECUTIVE THOROUGHLY EXPERIENCED ALL phases of development, production, and sales of all types of mechanicals and specialties. Have following with jobbers, industrials, and government agencies on standard and special products, many in the approved state. Seek connection with small well-equipped company to assist on present production problems, but more particularly to develop increased production through new lines. Remuneration based on achievement of purpose. Address Box No. 236, care of INDIA RUBBER WORLD.

RUBBER TECHNOLOGIST — B.S. — AGE 40 — MARRIED. SIX years chief chemist for extruded rubber. One year molded goods experience. Trouble-shooter for varied technical problems related to insulated wire. Familiar with all types natural and synthetic rubbers. Capable, resourceful, and reliable. Desires responsible position in progressive small or medium-sized plant. Address Box No. 237, care of INDIA RUBBER WORLD.

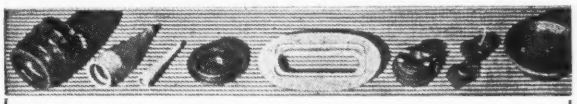
CHEMICAL ENGINEER, VICE PRESIDENT IN CHARGE OF production and research for past two years, desires responsible position with aggressive firm. Fifteen years' experience plastics, coatings, adhesives: research, application, development, production: calendering, molding, extrusion. Company being merged—available immediately. Prefer Midwest location. Age 37—family. Address Box No. 238, care of INDIA RUBBER WORLD.

PRODUCTION SUPERVISOR WITH 20 YEARS' EXPERIENCE mill room, press line, mechanicals: at present in research. Knowledge of compounding. Address Box No. 239, care of INDIA RUBBER WORLD.

SALES MANAGER, 13 YEARS' EXPERIENCE, CAPABLE OF engineering mechanical rubber and sponge molds, familiar with factory production, age 35, experienced in handling men, widely known in industry; salary $12,000 or equivalent bonus arrangement. Address Box No. 241, care of INDIA RUBBER WORLD.

MACHINERY & SUPPLIES WANTED

WANTED: GOOD USED 60" PLASTIC MILL AND BANBURY. Address Box No. 235, care of INDIA RUBBER WORLD.



INDUSTRIAL RUBBER GOODS

BLOWN — SOLID — SPONGE

FROM NATURAL, RECLAIMED, AND SYNTHETIC RUBBER

THE BARR RUBBER PRODUCTS CO. SANDUSKY OHIO

BROCKTON TOOL COMPANY

Central Street — QUALITY MOULDS FOR ALL PURPOSES — South Easton, Mass.

THE FIRST STEP—A QUALITY MOULD

(Classified Advertisements Continued on Page 277)

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$1.00 irr.	Oct. 19	Oct. 8
Baldwin Rubber Co.	Com.	0.05 ext.	Oct. 25	Oct. 15
	Com.	0.15 q.	Oct. 25	Oct. 15
Boston Woven Hose & Rubber Co.	Com.	4.00 ext.	Nov. 26	Nov. 15
	Com.	0.50 q.	Nov. 26	Nov. 15
Converse Rubber Co.	1st Pfd.	0.25 q.	Oct. 8	Oct. 1
	2nd Pfd.	0.20 q.	Oct. 8	Oct. 1
Crown Cork & Seal Co., Inc.	Com.	0.50 q.	Nov. 15	Oct. 15
Dayton Rubber Co.	Com.	0.30	Oct. 25	Oct. 11
	"A"	0.50 q.	Oct. 25	Oct. 11
Detroit Gasket & Mfg. Co.	Com.	O.12½	Oct. 25	Oct. 12
General Electric Co., Ltd.	Com.	7½% extra	Nov. 5	Sept. 30
	Com.	10% final	Nov. 5	Sept. 30
Goodall Rubber Co.	Com.	0.15	Nov. 15	Nov. 1
Goodyear Tire & Rubber Co.	Com.	1.00 q.	Dec. 15	Nov. 15
	Pfd.	1.25 q.	Dec. 15	Nov. 15
Gro-Cord Rubber Co.	Com.	0.10	Sept. 30	Sept. 20
Johnson & Johnson	Com.	5% stock	Nov. 15	Oct. 25
Lee Rubber & Tire Corp.	Com.	1.50 ext.	Oct. 28	Oct. 15
	Com.	0.50 q.	Oct. 28	Oct. 15
Link Belt Co.	Com.	1.00 ext.	Dec. 1	Nov. 3
	Com.	1.00 q.	Dec. 1	Nov. 3
O'Sullivan Rubber Corp.	Pfd.	0.25 q.	Oct. 1	Sept. 15
Thermoid Co.	$2.50 Cv. Pfd.	0.62½ q.	Nov. 1	Oct. 25

United States Rubber Statistics—July, 1948

(All Figures in Long Tons, Dry Weight)

	Production	Imports	Total	Distribution: Consumption	Distribution: Exports	Stocks
Natural rubber, total	0	*60,121	60,121	46,977	466	117,233
Natural latex, total	0	3,654	3,654	1,792	0	11,213
Natural rubber and latex, total	0	63,775	63,775	48,769	466	128,446
Synthetic rubber, total	† 39,898	9	41,276	34,511	257	96,211
	‡ 1,369					
GR-S	† 33,275	0	33,309	27,008	63	§78,219
	‡ 34					
Butyl	† 5,066	9	5,075	4,707	5	10,061
Neoprene	† 1,557	0	2,089	2,251	121	5,528
	‡ 532					
Nitrile	‡ 803	0	803	545	68	2,403
Natural rubber and latex, and synthetic rubber, total	41,267	63,784	105,051	83,270	723	224,657
Reclaimed rubber	17,712	0	17,712	19,291	712	34,302
Grand Totals	58,979	63,784	122,763	102,561	1,435	258,959

*Includes adjustment of -48 tons applicable to May, 1948.
†Government plant production.
‡Private plant production.
§Includes 71 tons shipped for export, but not cleared.

Estimated Automotive Pneumatic Casings and Tube Shipments, Production, and Inventory, August, July, 1948; First Eight Months, 1948-1947

	1948 August	1948 % of Change from Preceding Month	1948 July	1948 First Eight Months	1947 First Eight Months
Passenger Casings					
Shipments					
Original equipment	1,884,121		1,927,718	13,977,715	12,606,593
Replacement	4,636,782		4,591,659	29,471,255	34,917,710
Export	55,061		40,599	438,324	1,089,568
Total	6,575,964	+ .24	6,559,976	43,887,294	48,613,871
Production	5,768,614	+ 4.57	5,516,349	45,889,683	50,926,378
Inventory end of month	7,462,765	− 9.59	8,253,829	7,462,765	3,904,743
Truck and Bus Casings					
Shipments					
Original equipment	405,751		450,919	3,677,626	3,708,418
Replacement	772,331		765,078	5,204,228	6,354,373
Export	80,837		89,971	779,361	1,120,225
Total	1,258,919	− 3.60	1,305,968	9,661,215	11,183,016
Production	1,193,942	+ 3.30	1,155,797	10,000,120	12,049,930
Inventory end of month	1,872,354	− 4.12	1,952,751	1,872,354	1,559,531
Total Automotive Casings					
Shipments					
Original equipment	2,289,872		2,378,637	17,655,341	16,315,011
Replacement	5,409,113		5,356,737	34,675,483	41,272,083
Export	135,898		130,570	1,217,685	2,209,793
Total	7,834,883	− .40	7,865,944	53,548,509	59,796,887
Production	6,962,556	+ 4.35	6,672,146	55,889,803	62,976,308
Inventory end of month	9,335,119	− 8.54	10,206,580	9,335,119	5,464,274
Passenger and Truck and Bus Tubes					
Shipments					
Original equipment	2,292,212		2,364,715	17,660,447	16,310,845
Replacement	4,522,117		4,364,685	27,948,132	29,810,077
Export	102,811		78,014	742,457	1,905,957
Total	6,917,140	+ 1.61	6,807,414	46,351,036	48,026,879
Production	6,638,552	+15.46	5,749,632	47,138,042	52,007,414
Inventory end of month	8,532,660	− 2.60	8,760,344	8,532,660	6,837,199

Note: Cumulative data on this report include adjustments made in prior months.
Source: The Rubber Manufacturers' Association, Inc.

Financial

(*Continued from page 238*)

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BROCKTON TOOL COMPANY

Central Street **QUALITY MOULDS FOR ALL PURPOSES** South Easton, Mass.

THE FIRST STEP—A QUALITY MOULD

(Classified Advertisements Continued on Page 277)

United States Imports, Exports, and Reexports of Crude and Manufactured Rubber

	July, 1948	
	Quantity	Value
Exports of Domestic Merchandise		
UNMANUFACTURED, Lbs.		
Chicle	64,170	$26,591
Balata	600	2,090
Synthetic rubbers: GR-S	140,620	33,767
Butyl	550	135
Neoprene	270,107	90,957
Nitrile	151,806	61,286
"Thiokol"	10,000	5,185
Polyisobutylene	6,763	2,437
Other	43,097	13,253
Reclaimed rubber	1,594,424	122,310
Scrap rubber	2,656,980	74,089
TOTALS	4,939,117	$432,100
MANUFACTURED		
Rubber cement ...gals.	33,217	$48,894
Rubberized fabric: auto cloth ...sq. yds.	109,098	49,204
Piece goods and hospital sheeting ...sq. yds.	56,444	50,714
Rubber footwear: boots ...prs.	7,763	32,654
Shoes ...prs.	14,519	18,297
Rubber-soled canvas shoes ...prs.	133,053	223,366
Soles ...doz. prs.	17,770	67,479
Heels ...doz. prs.	47,117	40,180
Rubber soling and toplift sheets ...lbs.	73,090	17,828
Gloves and mittens ...doz. prs.	17,246	47,984
Drug sundries: water bottles and syringes ...no.	31,954	18,739
Other	.....	201,699
Rubber and rubberized clothing	.....	61,772
Balloons	.....	105,555
Toys and balls	.....	47,405
Bathing caps ...doz.	1,349	5,292
Rubber bands ...lbs.	2,758	2,354
Erasers ...lbs.	15,572	14,629
Hard rubber goods: battery boxes ...no.	28,674	30,476
Other electrical goods ...lbs.	148,963	91,028
Combs, finished ...doz.	4,451	6,347
Other	.....	16,421
Tire casings: truck and bus ...no.	133,999	5,980,587
Auto	40,972	622,456
Inner tubes: auto, truck, bus ...no.	127,058	493,973
Other casings and tubes, except auto ...no.	42,948	663,257
Solid tires: auto and truck ...no.	5,841	170,428
Other ...lbs.	2,465	1,007
Tire repair materials: camelback ...lbs.	142,838	36,217
Other ...lbs.	104,699	50,472
Rubber and friction tape ...lbs.	39,441	33,366
Belting: auto fan belts ...lbs.	78,881	92,400
Other ...lbs.	1,113,485	919,719
Hose and tubing: garden hose ...lbs.	53,486	19,098
Other ...lbs.	709,262	489,484
Rubber packing ...lbs.	162,350	128,923
Mats, flooring, tiling ...lbs.	318,152	80,685
Thread: bare ...lbs.	18,277	26,126
Textile, covered ...lbs.	4,948	14,267
Gutta percha manufactures ...lbs.	5,238	6,301
Latex and other compounded rubber for further manufacture ...lbs.	184,420	82,906
Other rubber products	.....	250,121
TOTALS	.....	$11,360,110
GRAND TOTALS, ALL RUBBER EXPORTS	.....	$11,792,210
Reexports of Foreign Merchandise		
UNMANUFACTURED, Lbs.		
Crude rubber	1,043,122	$243,774
Chicle	11,129	12,586
Butyl copolymers, isoprene, etc.	10,244	1,915
Other synthetic rubbers	2,000	400
TOTALS	1,066,495	$258,669
MANUFACTURED		
Rubber boots ...prs.	686	$1,960
Drug sundries, except syringes and water bottles	.....	3,536
Tire casings and tubes, except auto ...no.	5	1,235
Hose and tubing: garden hose ...lbs.	517	342
Other ...lbs.	2,280	690
Latex and other compounded rubber for manufacture ...lbs.	490	173
TOTALS	.....	$7,936
GRAND TOTALS, ALL RUBBER REEXPORTS	.....	$266,650

	July, 1948	
	Quantity	Value
Imports for Consumption of Crude and Manufactured Rubber		
UNMANUFACTURED, Lbs.		
Crude rubber	134,555,848	$25,206,980
Rubber latex	8,183,964	2,002,902
Guayule	224,000	23,587
Balata	268,448	87,327
Jelutong or Pontianak	458,795	170,949
Gutta percha	42,519	35,001
Chicle	112,334	257,109
Synthetic rubber	2,198,273	403,469
Scrap rubber	1,533,398	31,735
TOTALS	147,577,579	$28,219,059
MANUFACTURED		
Tires: auto, bus, truck ...no.	562	$10,481
Bicycle ...no.	2,116	1,981
Other ...no.	750	580
Inner tubes ...no.	509	1,505
Rubber footwear: Boots ...prs.	7,000	7,627
Shoes and overshoes ...prs.	92	334
Rubber-soled canvas shoes ...prs.	10,930	8,797
Rubber balls: golf ...no.	13,224	5,190
Other, except tennis ...no.	270,920	28,114
Toys, except balloons	.....	999
Hard rubber products	.....	1,180
Rubberized printing blankets ...lbs.	53	285
Rubber and cotton packing ...lbs.	8,636	10,730
Gaskets and valve packing	.....	517
Belting ...lbs.	4,749	7,721
Hose and tubing	.....	118
Heels and soles ...lbs.	16,464	525
Rubber bands ...lbs.	1,721	924
Soft rubber goods, except drug sundries	.....	12,909
Synthetic rubber products	.....	340
TOTALS	.....	$100,857
GRAND TOTALS, ALL RUBBER IMPORTS	.....	$29,319,916

SOURCE: Bureau of Census, United States Department of Commerce, Washington, D. C.

Rims Approved and Branded by The Tire & Rim Association, Inc.

RIM SIZE	Sept., 1948
15° & 16° D. C. Passenger	
15x4.50E	13,204
16x4.00E	129,303
16x4.50E	170,061
15x5.00E	83,602
16x5.00F	25,604
15x5.50F	60,580
16x6.00F	7,777
15x4.50E—Hump	12,718
16x4.50E—Hump	11,034
15x4½-K	39,140
16x4½-K	53,043
15x5-K	465,958
16x5-K	91,929
15x5½-K	92,343
15x6-L	115,934
16x6-L	12,067
15x6½-L	43,949
15x4½-K—Hump	207,432
15x5-K—Hump	63,553
15x5½-K—Hump	59,563
15x6-L—Hump	20,154
17° & Over	
19x2.15B	8,233
Truck-Bus	
17x5.0	24,918
18x5.0	6,486
20x5.0	21,636
12x5.00S	1,109
20x5.00S	8,101
24x5.00S	485
17x5.5	32,213
20x5.5	1,564
20x5.50S	15,350
15x6.0	1,244
20x6.0	145,390
20x6.00S	44,960
15x6.00T	133
18x6.00T	359
20x6.00T	3,333
20x6.5	6,258
15x6.50T	1,315
18x6.50T	450
20x6.50T	34,486
20x7.0	16,107
15x7.00T	429
20x7.00T	6,398
22x7.33V	1,554
15x7.5	240
20x7.5	21,094
22x7.5	11,007
24x7.5	3,256
20x7.50V—Flat Base*	6,679
24x7.50V—Flat Base*	775
22x8.00V	1,553
19x8.37V	1,099
24x8.37V	722
19x9.00V	110
24x9.00V	42
24x10.00W	1,495
Semi D. C. Truck	
16x4.50E	3,322
15x5.50F	36,515
16x5.50F	39,047
16x6.50H	3,891
Tractor & Implement	
12x2.50C	9,943
12x3.00D	56,182
15x3.00D	46,483
18x3.00D	2,526
19x3.00D	21,244
21x3.00D	480
36x3.00D	2,380
16x4.25KA	10,508
20x4.50E	11,093
18x5.50F	23,186
20x5.50F	14,248
24x5.50R	6,854
20x8.00T	387
24x8.00T	4,602
W5-30	3,201
W7-24	7,684
W8-24	980
W8-24 (H)	4,204
W8-32	1,000
W8-36	12,397
W8-40	401
W9-28	26,788
W9-36	705
W9-38	5,916
W10-28	3,603
W10-28 (H)	1,020
W10-36 (H)	2,010
W10-38	2,049
W10-38 (H)	867
W12-26	351
W12-38	1,390
W13-26	1,062
DW9-38	4,084
DW10-26	332
DW10-38	13,923
DW10-42	1,353
DW11-26	4,528
DW11-28	3,573
DW11-36	1,491
DW11-38	6,299
DW12-26	1,023
DW12-30	2,959
DW12-34	427
DW14-28	366
DW14-30	1,009
DW14-32	228
DW14-34	142
DW16-26	163
Earth Mover	
20x11.25	521
24x11.25	245
24x13.00	134
24x15.00	229
25x15.00	497
25x17.00	7
32x18.00	2
TOTAL	2,621,576

*These rims, listed as 7.50V flat base, do not at present have Association approval. A "Not Branded" side ring is used on a "Branded" base made to 7.33V flat base rim dimensions.

Compounding Ingredients—Price Changes and Additions

Aquablaks	lb.	$0.085 /	$0.165
B-3223	lb.	2.50	
Crown Clay	ton	13.00 /	29.50
Cryptone BT	lb.	.08 /	.085
GD-4440	lb.	3.50	
GD-5280, -5424, -53481	lb.	2.50	
GD-5296	lb.	1.25	
GD-5386	lb.	2.00	
Parador A	lb.	2.25	
C	lb.	3.25	
E	lb.	.55	
F	lb.	.47	
I	lb.	2.00	
K	lb.	.43	
Perbunan 18	lb.	.43 /	.45
26NS60, 26NS90	lb.	.44 /	.46
35NS90	lb.	.51 /	.53
Protox-166	lb.	.135 /	.1375
Resodor Nos. 1, 5	lb.	2.50	
No. 10	lb.	.40	
Seedine	lb.	.1485	.1705

OUR NEW MACHINERY
HYDRAULIC PRESSES
CUTTERS—LAB. MILLS
BRAKES—LIFT TABLES
MILLS—MIXERS
SUSAN GRINDERS

NEW MACHINERY REBUILT

OUR 5-POINT REBUILDING PROCESS
1—INSPECTION
2—DISASSEMBLY
3—REBUILDING
4—MODERNIZING
5—GUARANTEE

L. ALBERT & SON
COAST-TO-COAST
TRENTON, N. J.—MAIN OFFICE

CLASSIFIED ADVERTISEMENTS
Continued

MACHINERY & SUPPLIES FOR SALE

FOR SALE: 1—WATSON STILLMAN LOW AND HIGH (3000#) pressure with pumps, motors, and accessories. 1—48 x 48" 3-opening Hydraulic Press with 4-10" rams; other presses, various sizes. 1—5' x 24' Vulcanizer, 100# pressure, quick-opening door. 6—Royle and other Tubers 2½ to 8". Also mills, calenders, etc. Send us your inquiries. CONSOLIDATED PRODUCTS CO., INC., 13-16 PARK ROW, NEW YORK 7, NEW YORK. Telephone: BArclay 7-0600.

FOR SALE: BAKER-PERKINS 200 GAL. & 100 GAL. DOUBLE arm jack. Mixers, also 50, 20, 9 & Lab. 0.7 gals.; Royle #2 Perfected Extruder; Thropp 16" x 36", 2-roll Rubber Mill, also Lab. size, 30", 36", 40", 42", 48", 60", 84", sizes; Rubber Calenders 30", 54", & 60"; Rubber Tubers 2" to 6"; Large stock Hydraulic Presses from 12" x 12" to 42" x 48" platens from 50 to 500 tons; Hydraulic Pumps & Accumulators; HPM 4-oz. Injection Molding Machine, other sizes 1 to 16 oz.; Stokes & Colton single punch & rotary preform Tablet Machines, ½" to 2"; Banbury Mixers; Kettles; Tanks; Rotary Cutters; Grinders & Crushers; Mixers; Pumps; etc. SEND FOR SPECIAL BULLETIN.
WE BUY YOUR SURPLUS MACHINERY
STEIN EQUIPMENT CO.
90 WEST STREET, NEW YORK 6, N. Y.

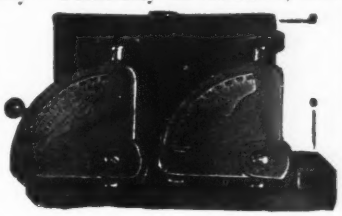
FOR SALE—1 BIRMINGHAM 6" x 12" EXPERIMENTAL CALENDER with 7½ H.P. motor. 1 Birmingham 6" x 12" Experimental Mill with 5 H.P. motor. Both complete with guards, safety rigging, piping and tables. Purchased new 1925. Operated intermittently over period ten years. Excellent condition. Address Box No. 227, care of INDIA RUBBER WORLD.

FOR SALE: 2 THROPP 16" x 30" TWO-ROLL MILLS; 5 HEAVY-duty double-arm jacketed mixers, 50 and 150 gal. working capacity. 9 Rotary 16-punch pellet presses. PERRY, 1524 W. Thompson St., Phila. 21, Pa.

FOR SALE—SPARE PARTS FOR BANBURY MIXER BODIES, all sizes, quick service. Also available completely rebuilt #9 Banbury bodies, spray or jacketed, to exchange for worn, and save you time. The best of materials and workmanship, guided by 14 years' specialized experience. INTERSTATE WELDING SERVICE, 914 Miami Street, Akron 11, Ohio.

HOWE MACHINERY CO., INC.
30 GREGORY AVENUE PASSAIC, N. J.
Designers and Builders of
"V" BELT MANUFACTURING EQUIPMENT
Cord Latexing, Expanding Mandrels, Automatic Cutting, Skiving, Flipping and Roll Drive Wrapping Machines.
ENGINEERING FACILITIES FOR SPECIAL EQUIPMENT
Call or write.

An International Standard of Measurement for—
Hardness • Elasticity • Plasticity of Rubber, etc.



Is the DUROMETER and ELASTOMETER (23rd year)
These are all factors vital in the selection of raw material and the control of your processes to attain the required modern Standards of Quality in the Finished Product. Universally adopted.
It is economic extravagance to be without these instruments. Used free handed in any position or on Bench Stands, convenient, instant registrations, fool-proof.
Ask for our Descriptive Bulletins and Price List R-4 and R-5
THE SHORE INSTRUMENT & MFG. CO.
Van Wyck Ave. and Carll St., JAMAICA, NEW YORK
Agents in all foreign countries.

Economical **NEW** Efficient
Mills - Spreaders - Churns
Mixers - Hydraulic Presses
Calenders
...GUARANTEED...
Rebuilt Machinery for Rubber and Plastics
LAWRENCE N. BARRY
41 Locust Street Medford, Mass.

SPECIALIZING IN
USED MACHINERY FOR THE **RUBBER**
AND ALLIED INDUSTRIES
MILLS, CALENDERS, HYDRAULIC PRESSES.
TUBERS, VULCANIZERS, MIXERS, ETC.
ERIC BONWITT 431 So. Dearborn St., Chicago 5, Ill.

GUARANTEED REBUILT MACHINERY
IMMEDIATE DELIVERIES FROM STOCK
MILLS, CALENDERS, TUBERS
VULCANIZERS, ACCUMULATORS
UNITED
HYD. PRESSES, PUMPS, MIXERS
CUTTING MACHINES, PULVERIZERS
UNITED RUBBER MACHINERY EXCHANGE
NEW ADDRESS: 183-189 ORATON ST. CABLE "URME" NEWARK 4, N. J.

(Classified Advertisements Continued on Page 279)

Malayan Rubber Statistics

The following statistics for July and August, 1948, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C. 2, England

Ocean Shipments from Singapore and Malayan Union—In Tons

To	Sheet and Crepe: Singapore Export Proper		Sheet and Crepe: Malayan Union Transshipped		Sheet and Crepe: Malayan Union Direct Shipments		Latex, Concentrated Latex, and Revertex (Dry Rubber Content): Singapore Export Proper		Latex, Concentrated Latex, and Revertex (Dry Rubber Content): Malayan Union Transshipped		Latex, Concentrated Latex, and Revertex (Dry Rubber Content): Malayan Union Direct Shipments	
	July	August	July	August	July	August	July	August	July	August	July	August
Argentina	9	5	145	....	....	5	....	....	....	....	....	....
Australia	1,951	1,349	85	50	329	172	15	13	95	44	3	....
Belgium	145	235	7	80	423	320	....	5	108	26	....	1
Canada	1,262	1,546	153	43	1,584	1,571	....	....	....	....	....	....
Chile	352	299	....	....	50	68	....	....	....	....	....	....
China	100	1,295	....	....	....	....	....	....	....	....	....	....
Cyprus	31	....	....	....	....	....	....	....	....	....	....	....
Czechoslovakia	....	100	....	80	....	945	....	....	....	....	....	....
Denmark	399	147	79	48	355	239	....	2	5	....	....	....
Egypt	15	3	....	....	....	....	....	....	1	....	....	....
Finland	50	290	....	150	....	35	....	6	....	....	5	....
France	2,564	1,779	161	124	1,933	1,604	....	....	....	....	11	....
Germany	769	502	29	....	718	423	5	....	....	....	....	....
Hong Kong	67	481	....	....	111	90	....	....	....	....	....	....
Iraq	....	3	....	....	....	....	....	....	....	....	....	....
Italy	84	375	16	8	240	390	2	....	....	7	9	....
Japan	44	275	135	30	865	1,644	....	....	51	....	....	....
Mexico	275	522	....	75	495	365	....	....	....	12	....	....
New Zealand	50	152	20	80	5	....	....	3	....	11	....	....
Netherlands	170	110	....	....	300	215	....	55	....	19	....	13
Norway	130	30	....	....	....	160	....	....	4	....	....	....
Other countries in South America	14	240	....	25	150	170	....	....	....	....	....	....
Africa	350	50	....	....	....	....	....	....	....	....	....	....
Asia	2	....	....	....	....	....	....	....	....	....	....	....
Pakistan	70	14	....	....	....	....	....	....	....	....	....	....
Portugal	57	5	....	20	10	20	....	....	....	....	....	....
Rumania	175	....	100	....	126	....	6	....	....	....	....	....
Russia	4,500	9,061	....	....	8,830	8,935	29	90	....	....	....	....
Spain	....	600	....	25	40	300	....	....	....	....	....	48
Sweden	515	785	7	18	403	178	....	6	13	....	....	....
Switzerland	13	49	....	....	....	....	....	....	....	....	....	....
Syria	2	....	....	....	....	....	....	....	....	....	....	....
Turkey	5	200	....	....	50	45	....	....	....	....	....	....
Union of South Africa	1,019	793	90	85	....	349	2	....	5	6	....	....
Union of India	....	278	....	....	5	615	....	....	....	....	....	....
United Kingdom	6,894	6,559	2,007	3,456	10,275	10,083	1,298	283	46	41	146	70
U. S. A.	15,480	13,623	2,477	1,150	7,317	10,243	1,274	747	....	....	922	626
TOTAL	37,563	41,755	5,511	5,547	34,614	39,184	2,631	1,210	328	166	1,096	758

	Dry Rubber: July	Dry Rubber: August	Wet Rubber (Dry Weight): July	Wet Rubber (Dry Weight): August
Foreign Imports of Rubber in Long Tons				
Singapore Imports from				
Banka and Billiton	292	160	....	....
Brunei	194	112	4	1
Burma	....	....	....	1
Celebes and Moluccas	5	....	....	....
Dutch Borneo	1,218	687	....	138
French Indo-China	....	....	97	153
Java	965*	513	....	....
North Borneo	1,359	973	51	39
Other countries in Asia	15	15	3	....
Dutch Islands	84	58	9	2
Rhio Residency	913	529	125	85
Sarawak	4,212	2,580	81	8
Sumatra	7,058	10,903†	6,760	7,518
Total	16,315	16,530	7,130	7,945
Federation of Malaya Imports from				
Burma	132	81	45	17
Siam	909	638	31	11
Sumatra	1,110	832	1,805	1,260
Total	2,151	1,551	1,881	1,288

*Includes 82 tons sole crepe.
†Includes 4 tons sole crepe.

	Tons: July	Tons: August
Dealers' Stocks		
Singapore	52,003	49,929
Penang & Province Wellesley	12,865	11,895
Total	64,868	61,824
Port Stocks in Private Lighters and Railway Godowns		
Penang & Province Wellesley	7,257	8,024
Port Dickson	....	29
Port Swettenham	2,840	2,519
Singapore	9,117	9,959
Teluk Anson	270	330
Total	19,484	20,861
Production		
Estates	35,193	33,727
Small holdings (est.)	22,972	22,875
Total	58,165	56,602

Pyroxylin-Coated Fabrics and Paper

The following are the figures for pyroxylin-coated fabrics and paper, except shade cloth, for the second quarter and first six months of 1948. These statistics, based on reports from 26 companies, represent the operations of processors who coat or impregnate fabrics or paper with soluble cotton or pyroxylin preparations, either separately or in combination with other materials. "Light" cotton fabrics include sheetings and print cloths; "heavy" cotton fabrics include drills, ducks, sateens, broken twills, and moleskins. All figures are given in linear yards, except for pyroxylin spread and monthly capacity, both of which are given in pounds.

Total (except non-fabric materials):*	April	May	June	First Half 1948
Shipments	4,772,227	4,021,129	4,090,171	31,119,338
Unfilled orders†	4,408,276	4,630,828	4,522,771	4,522,771
Light cotton fabrics:				
Shipments	1,972,473	1,960,723	1,964,584	15,077,720
Unfilled orders†	1,932,893	2,097,887	1,917,069	1,917,069
Heavy cotton fabrics:				
Shipments	1,558,128	1,282,811	1,267,955	9,865,090
Unfilled orders†	1,833,209	1,700,021	1,651,065	1,651,065
Custom coating:‡				
Shipments	1,241,626	777,595	857,632	6,176,528
Unfilled orders†	642,174	832,920	954,637	954,637
Non-fabric materials:				
Shipments	141,660	195,746	249,283	1,045,717
Unfilled orders†	130,425	219,494	239,586	239,586
Pyroxylin actually spread, lbs.	3,615,803	3,039,856	3,450,520	24,326,345
Monthly capacity§, lbs.	16,790,347	16,790,347	16,790,347	....

*Data include an undetermined quantity of custom coating of non-fabric materials.
†Orders on hand at the close of the month, exclusive of contracts, with shipping dates unspecified.
‡Data for fabrics other than cotton are included with custom coating to avoid disclosing data for individual establishments.
§Based on all machines suitable for pyroxylin coating, assuming 600 working hours per month of entire production on 53"-1.32 sateen coated to a finished weight of 17.5 oz. linear yd., assuming 40% solids.
SOURCE: Bureau of the Census, United States Department of Commerce Washington 25, D. C.

Applications Listed Incorrectly

An error was made in printing the advertisement on Sharples Accelerator 57-1 (zinc dimethyldithiocarbamate) in the September, 1948, issue of India RUBBER WORLD. The applications were incorrectly listed as: vulcanizing agent, primary accelerator, secondary accelerator, and retarder for neoprene. The applications should have been listed as primary and secondary accelerator.

CLASSIFIED ADVERTISEMENTS

Continued

BUSINESS OPPORTUNITIES

JOBBERS: WRITE FOR PROPOSITION ON HOUSEHOLD, SURgical, industrial rubber gloves. GLOVE MANUFACTURER, Box 247, Marion, Ohio.

EXPORT DEPARTMENT OF PLASTICS MATERIAL MANUFACturing concern is looking for a vinyl resin processor who will furnish vinyl molding and extrusion compounds on a continuous basis. Address Box No. 244, care of India RUBBER WORLD.

LIQUIDATING

COMPLETE PLANT OF

THE C. E. MILLER RUBBER CO.

OF ANDERSON, INDIANA

including:

Mills	Pumps
Mixers	Tubers
Extruders	Tumblers
Calenders	Stock Cutters
Vulcanizers	Compressors
Hydraulic Presses	

And Equipment Usually Found in a Modern Plant

Inspection Can Be Arranged

Send For Complete List With Prices

FIRST MACHINERY CORP.
157 HUDSON ST.
NEW YORK 13, N. Y.

Compounding Facilities Available - - We invite your inquiries.

PEQUANOC RUBBER COMPANY

Main Street, Butler, N. J.

WANTED — Large engineering firm wishes to acquire several complete Rubber Plants through purchase of (1) capital stock, (2) assets, (3) machinery and equipment, whole or in part. Personnel retained where possible, strictest confidence. Box 1220, 1474 Broadway, New York 18, N. Y.

WANTED FOR ENGLAND

Sole manufacturing rights for any mass production article in Ebonite or Rubber preferably connected with the Accumulator industry, by the largest manufacturers in England of moulded Ebonite accumulator cases under American patents.

EBONITE CONTAINER CO., LTD.

Belle Isle — York Way
London, N. 7, England

RUBBER MACHINERY
IS OUR BUSINESS

- Mills
- Calenders
- Presses
- Pumps
- Banburys
- Tubers
- Vulcanizers
- Grinders

Immediate Delivery — Good Equipment

Reasonable Prices—Each Installation Engineered

AKRON RUBBER MACHINERY CO.

P. O. Box 88 WA-0131 Akron, Ohio

GET MORE FOR YOUR SURPLUS EQUIPMENT

List it with our bureau
And Sell Directly to the next user.

All Rubber Manufacturers Get Our Offerings Regularly. They need such units as

RUBBER MILLS CALENDERS
BANBURY and W & P MIXERS
EXTRUDERS VULCANIZERS
HYDRAULIC PRESSES

For Quicker Action and Better Price
Send Full Details and YOUR Price to

EQUIPMENT FINDERS BUREAU

6 Hubert Street New York 13, N. Y.

AIR BAG BUFFING MACHINERY
STOCK SHELLS HOSE POLES
MANDRELS

NATIONAL SHERARDIZING & MACHINE CO.
868 WINDSOR ST. HARTFORD, CONN.
Akron Representatives San Francisco New York

WANTED

Chemicals — Colors — Pigments
Resins — Solvents — Glues — Plasticizers
Other Raw Materials

CHEMICAL SERVICE CORPORATION

80 Beaver Street, New York 5 Hanover 2-6970

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GERMAN PATENTS

RELATING TO

VINYL POLYMERS

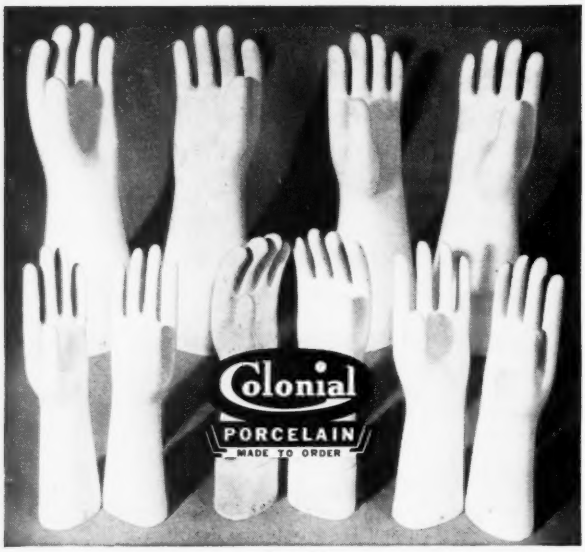
BY LAW VOGE AND M. HOSEH

PRICE $1 PER COPY *POSTPAID*

Special Discounts on Quantity Orders
Remittance Must Accompany Order

INDIA RUBBER WORLD

386 FOURTH AVE. NEW YORK 16, N. Y.



Porcelain Glove Forms

— for dipped rubber gloves, including linemen's or electricians' gloves and surgeons' gloves. Some are made from our own stock molds and others from customers' molds.

Write today for our new catalog covering rubber glove and other forms for dipped rubber goods. Prompt attention given to requests for quotations based on your specifications or stock items.

The Colonial Insulator Company

993 Grant St. Akron 11, Ohio

Chicago Office: 2753 W. North St.

CONSULTANTS & ENGINEERS

BERLOW AND SCHLOSSER CO.
Consultation and Technical Service
Paper, Textile and Wringer Rolls—Mechanicals
Molded Specialties—Cut Rubber Thread
401 INDUSTRIAL TRUST BUILDING
PROVIDENCE 3, R. I.

Dayton Chemical Products Laboratories
WEST ALEXANDRIA, OHIO
Adhesives, Bonding, Rubber Compositions

PHILIP TUCKER GIDLEY
CONSULTING TECHNOLOGIST — RESEARCH IN RUBBER
Chemical and physical tests, formulas, product development, new plant construction, and engineering.
Fairhaven Massachusetts

FOSTER D. SNELL, INC.
Our chemical, bacteriological, engineering and medical staff with completely equipped laboratories are prepared to render you Every Form of Chemical Service.
Ask for Booklet No. 15, "The Chemical Consultant and Your Business"
29 W. 15th St. New York 11, N. Y.

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Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	August, 1948 Quantity	August, 1948 Value	August, 1947 Quantity	August, 1947 Value
UNMANUFACTURED				
Balata ..... lbs.	3,239	$ 1,302	1,842	$ 6,934
Crude rubber	8,804,798	1,716,302	5,673,859	964,487
Gutta percha	500	1,749	.....	.....
Latex ..... lbs.	94,054	27,309	201,819	74,845
Rubber, powdered and waste ..... lbs.	193,300	6,240	507,300	21,250
Recovered ..... lbs.	1,241,600	99,618	1,695,400	126,125
Synthetic and substitute ..... lbs.	205,500	64,183	45,600	11,179
TOTALS	10,542,991	$1,916,703	8,125,820	$1,204,820
PARTLY MANUFACTURED				
Comb blanks of hard rubber	.....	$ 2,273	.....	$ 2,579
Hard rubber in rods or tubes ..... lbs.	2,285	1,555	470	782
Rubber thread, not covered	4,384	4,751	5,421	7,348
TOTALS	6,669	$ 8,579	5,891	$ 10,709
MANUFACTURED				
Belting	.....	$ 64,086	.....	$ 47,238
Boots and shoes of rubber, n.o.p. ..... prs.	17,542	27,532	17,367	30,392
Canvas shoes with rubber soles ..... prs.	95	254	289	920
Cement	.....	30,643	.....	54,825
Clothing of waterproofed cotton or rubber	.....	1,325	.....	6,682
Druggists' sundries	.....	46,515	.....	45,572
Gaskets and washers	.....	37,527	.....	24,673
Gloves ..... doz. prs.	1,126	3,729	1,565	4,773
Golf balls ..... doz.	1,823	7,718	728	3,509
Heels ..... prs.	27,958	6,056	2,342	328
Hose	.....	25,764	.....	42,767
Hot water bottles	.....	1,341	.....	4,639
Inner tubes, n. o. p. ..... no.	2,789	4,197	4,134	8,949
Bicycle ..... no.	3,676	1,565	1,154	987
Liquid sealing compound	.....	4,522	.....	9,884
Mats and matting	.....	42,316	.....	55,442
Nursing nipples ..... gross.	319	1,499	952	3,004
Packing	.....	17,361	.....	8,331
Raincoats ..... no.	.....	.....	382	915
Tires, pneumatic, n.o.p. no.	2,875	82,193	15,537	205,743
Bicycle ..... no.	5,325	5,264	1,161	1,736
Solid for automobile and motor trucks no.	15	248	9	373
Other	.....	7,707	.....	8,699
Tire repair material	.....	3,057	.....	21,230
Other rubber manufactures	.....	371,180	.....	319,561
TOTALS	.....	$ 793,599	.....	$ 911,132
TOTAL RUBBER IMPORTS	.....	$2,718,881	.....	$2,126,661

Exports of Crude and Manufactured Rubber

UNMANUFACTURED				
Crude rubber ..... lbs.	3,030,950	$ 599,721	5,808,908	$1,121,256
Waste rubber ..... lbs.	828,000	11,001	744,100	9,439
TOTALS	3,858,950	$ 610,722	6,553,008	$1,130,695
PARTLY MANUFACTURED				
Soling slabs of rubber .. lbs.	.....	$	150	$ 36
MANUFACTURED				
Belting, n.o.p. ..... lbs.	150,174	$ 103,617	323,523	$ 214,641
Belts, fan	.....	7,518	.....	1,900
Boots and shoes of rubber, n.o.p. ..... prs.	200,928	294,331	427,498	641,940
Canvas shoes with rubber soles ..... prs.	37,047	48,466	314,170	324,974
Clothing of rubber and waterproofed clothing ...	.....	17,993	.....	23,834
Heels	42,937	473	40,860	3,332
Hose	.....	107,084	.....	68,310
Inner tubes for motor vehicles ..... no	23,548	65,824	36,532	105,017
Soles ..... no.	1,500	395	798	269
Tires, pneumatic for motor vehicles .... no.	43,821	1,215,583	34,432	625,840
Other ..... no.	55	195	1,575	1,302
Wire and cable, copper, insulated	.....	136,018	.....	215,522
Other rubber manufactures	.....	12,151	.....	54,660
TOTALS	.....	$2,009,648	.....	$2,281,541
TOTAL RUBBER EXPORTS ..	.....	$2,620,370	.....	$3,412,272

Deformation Characteristics

(*Continued from page 207*)

one of the major efforts of this progress, but in spite of everything, variations will always exist in our raw materials and in our efforts to fabricate faster and with less human effort. The need of better and closer control will continue to exist, and the challenge is ever before us—how can we do it better?

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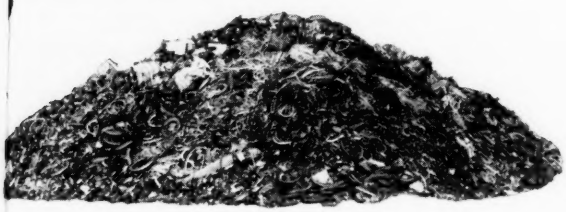
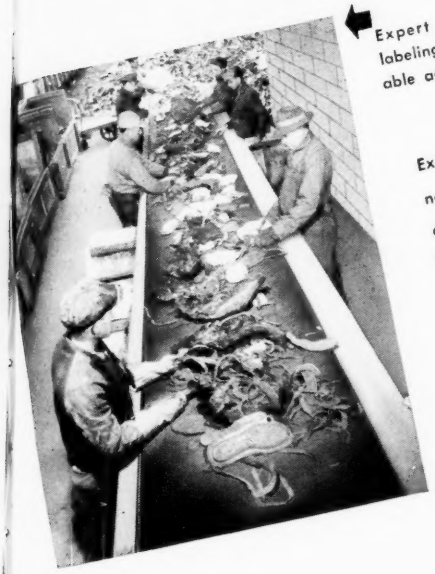


Jumble of Miscellaneous Scrap Rubber in Schulman yard.



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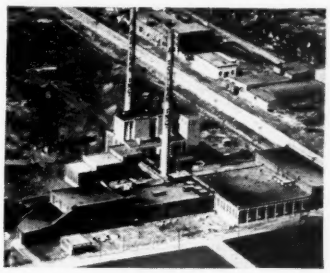
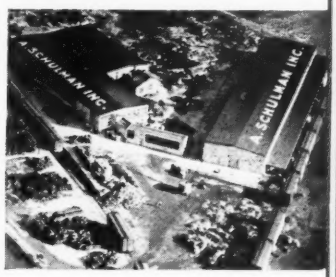


E. ST. LOUIS, ILLINOIS
Office & Warehouse, 14th & Converse Sts.



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